Our Dynamic Forests:

The Challenge of Management

Prepared by

Renewable Resources Sub-Committee of the
Public Advisory Committees to the
Environment Council of Alberta

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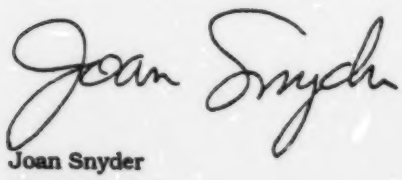
FOREWORD

In late 1985, the Public Advisory Committees to the Environment Council of Alberta began working toward a draft conservation strategy for Alberta. The Public Advisory Committees (PACs), comprising representatives of some 120 non-government organizations, are in many ways an ideal organization for developing a strategy that should touch the lives of all Albertans. The PACs bring together many diverse viewpoints, we are non-partisan, and we have members from across the province. Since the early days of the project, we have welcomed non-PAC participants, and have been delighted to receive the contributions of civil servants, industry spokespeople, academics, and the general public.

We have made progress since 1985: the *Prospectus for an Alberta Conservation Strategy* has been published and many meetings and workshops have been held. The principle of a conservation strategy increasingly has been endorsed by Albertans, and Alberta has been recognized across Canada as a leader in conservation strategy development. There have been important related events. For example, in September of 1987, every environment minister in Canada endorsed the final report of the National Task Force on Environment and Economy, which recommended that conservation strategies be in place in every province and territory by 1992. This same report was endorsed by the First Ministers at their November, 1987 meeting.

Since the publication of the *Prospectus*, the PACs have concentrated on preparing sectoral discussion papers. The Conservation Strategy Steering Committee determined early on to produce background papers on relevant sectors, such as agriculture, fish and wildlife, tourism, oil and gas, and others. These discussion papers look at the issues within each sector, but, more importantly, they investigate the interaction of each sector with the others. Their preparation has involved consulting with a wide range of interest groups — a conservation strategy principle in action — which has proven fruitful in developing ideas about the ultimate conservation strategy. These discussion papers will be used as background information for drafting a conservation strategy document. This report is one in the series of discussion papers.

Because there are as many opinions on our best future direction as there are Albertans, we welcome comments. The conservation strategy will be only as good as the work that goes into preparing it. Please address any comments on this discussion paper or others in the series to the Environment Council of Alberta at the address given on the page opposite. I would also encourage you to make your opinions known at public hearings, consultations, or other events which relate to sustainable use of our resources. Let's treat Alberta as if we plan to stay!



Joan Snyder
Chairperson
Conservation Strategy Steering Committee
Public Advisory Committees to the Environment Council of Alberta

ABOUT THIS DISCUSSION PAPER

Alberta is blessed with many valuable natural resources, not least of which are her great forests. They provide many benefits, ranging from ecosystem functions like nutrient and water cycling, and important habitat for wild animals and plants, to commercial products, such as timber and fur. Forests enhance our quality of life by creating jobs and providing a rich natural setting for recreation and contemplation.

Managing Alberta's forests is not easy; there are many conflicting demands. Oil and gas development extends throughout Alberta's forested areas, and land clearing for agriculture continues in several areas of the province. In recent years, there has been a major expansion of the forest industry, including sawmills, wood panel mills and pulp mills. More Albertans are enjoying outdoor recreation activities and public pressure for preservation of forest lands is increasing.

Our Dynamic Forests: The Challenge of Management explains how we currently manage our forests and describes the growing pressures, especially from our expanding forest industry. It also examines the complex interaction of forest users, issues related to timber management, and other forest resources. Progress toward the sustainable use of Alberta's forests is described and barriers to this achievement are discussed.

ACKNOWLEDGEMENTS

Several people were involved in writing this discussion paper and many more reviewed various drafts and sections. Still others participated in meetings and workshops that provided the authors with a broad exposure to the issues. They included professional foresters, academics and other knowledgeable, interested people within the forest industry, government agencies, and the interested general public.

Joan Snyder of Grande Prairie Regional College was the driving force behind this paper. Tim Williamson and Brian MacDonald provided foresters' perspectives and other members of the Renewable Resources Sub-Committee provided insights from other forest users. Discussion at the Forest Land Use Workshop (June, 1987) was very helpful in examining the different demands on our forests. Review comments and additional information provided by Alberta's Department of Forestry, Lands and Wildlife and the Canadian Institute of Forestry were greatly appreciated.

The staff at the Environment Council of Alberta were very supportive during the development of this paper. Brian Free of the Research Division helped coordinate, write, and edit, Margaret Hughes typed early drafts, former ECA editor Susan Morrow edited the original manuscript, Anita Meek made the subsequent revisions, and the current ECA editor Elizabeth Aike coordinated the cover art and illustrations and proofed the final manuscript.

Maryhelen Posey, Chairman
Renewable Resources Sub-Committee

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Chapter One

A Context For The Conservation of Alberta's Forest Resources

INTRODUCTION

Forests contain a multitude of resources: trees and other flora, wildlife, fresh air and water, and many others. However, they are more than the sum of their parts. A forest forms an intricate, functioning ecosystem; the vegetation is intimately connected to the soils, water, and atmosphere. Forest flora are important components of the soil nutrient cycle. They anchor the soil and withdraw nutrients to support their growth. These nutrients are stored in the biomass (vegetative matter) and later returned to the forest soil in the form of decaying roots, leaves, fallen limbs, and logs. Trees serve as an important carbon "sink," withdrawing large quantities of carbon dioxide, a "greenhouse gas," from the atmosphere. Forest vegetation also participates in the water cycle, drawing water out of the ground and releasing it to the atmosphere through transpiration. Forests have been called the "Lungs of the Earth" because of their important contribution of oxygen to the global atmosphere.

Alberta's forests have existed for thousands of years, continually changing and renewing themselves. Over the last century, human impact on the forest ecosystem has increased substantially and we now deem ourselves the managers of the forest.

Three features of Alberta's forests influence the management of this important resource. First, about two-thirds of Alberta is forested and virtually all of this is Crown land. Second, Alberta's forests are rich and diverse, providing a variety of natural resources that satisfy a wide range of both consumptive and non-consumptive users. Third, with proper management, Alberta's forests are renewable, providing an opportunity for sustained resource use. These features underlie the principal objective for forest management as endorsed by the Alberta Legislature:

> *To manage Alberta's forest lands in a manner ensuring a perpetual supply of benefits and products while maintaining a forest environment of high quality* (McDougall 1986).

This rather broad objective raises a number of questions related to forest management. What is (or will be in the future) the desired mix of benefits to be derived from our forests? At what stage should activities be constrained in order to avoid non-sustainable levels of use? What degree of environmental protection is needed to maintain a high-quality forest environment? No single interest group or stakeholder can provide the definitive response to these questions. Indeed, some stakeholders (i.e. future generations) cannot be queried. Society at large must confront these questions and determine socially optimal solutions. Deriving these solutions requires extended dialogue among the various interest groups. The Alberta Conservation Strategy can play a major role in this process by facilitating discussion, developing consensus, and by "providing practical suggestions for removing barriers to sustainable development" (Public Advisory Committees 1986).

Although Alberta's forests provide many benefits, including watershed protection, timber, fur, recreation, and tourism opportunities, this paper focuses on the timber resource, the development of which has a growing role in Alberta's economy. For more detailed discussion of the other forest resources, readers are encouraged to consult the other discussion papers in this series (see Appendix 1).

Many issues related to forestry are raised in this paper and some suggestions for improved forest management are offered. These suggestions are offered to stimulate discussion and are not the final solution. Broader input from the Alberta public will be needed to formulate a successful strategy for forest management.

HISTORICAL PERSPECTIVE

Recognition of the need to conserve forest resources in Alberta is not a new phenomenon. There have been events relating to or affecting conservation and development in Alberta since the turn of the century.

The importance of protecting the forests of the Eastern Slopes was acknowledged in the early decades of this century with the establishment of the Dominion Forestry Branch (1899), and passage of the 1906 Forest Reserves Act, the purpose of which was to preserve the forests and conserve water supplies through forest protection. In 1906, the federal Commission on Conservation was created to study problems in forest protection and forest conservation. These studies and associated representations by the Commission helped to increase support for forestry (Murphy 1985). The establishment of Banff and Waterton Lakes National Parks in 1885 and 1895 and the subsequent establishment of Jasper, Elk Island, and Wood Buffalo National Parks in 1907, 1913, and 1922 were other important early conservation initiatives.

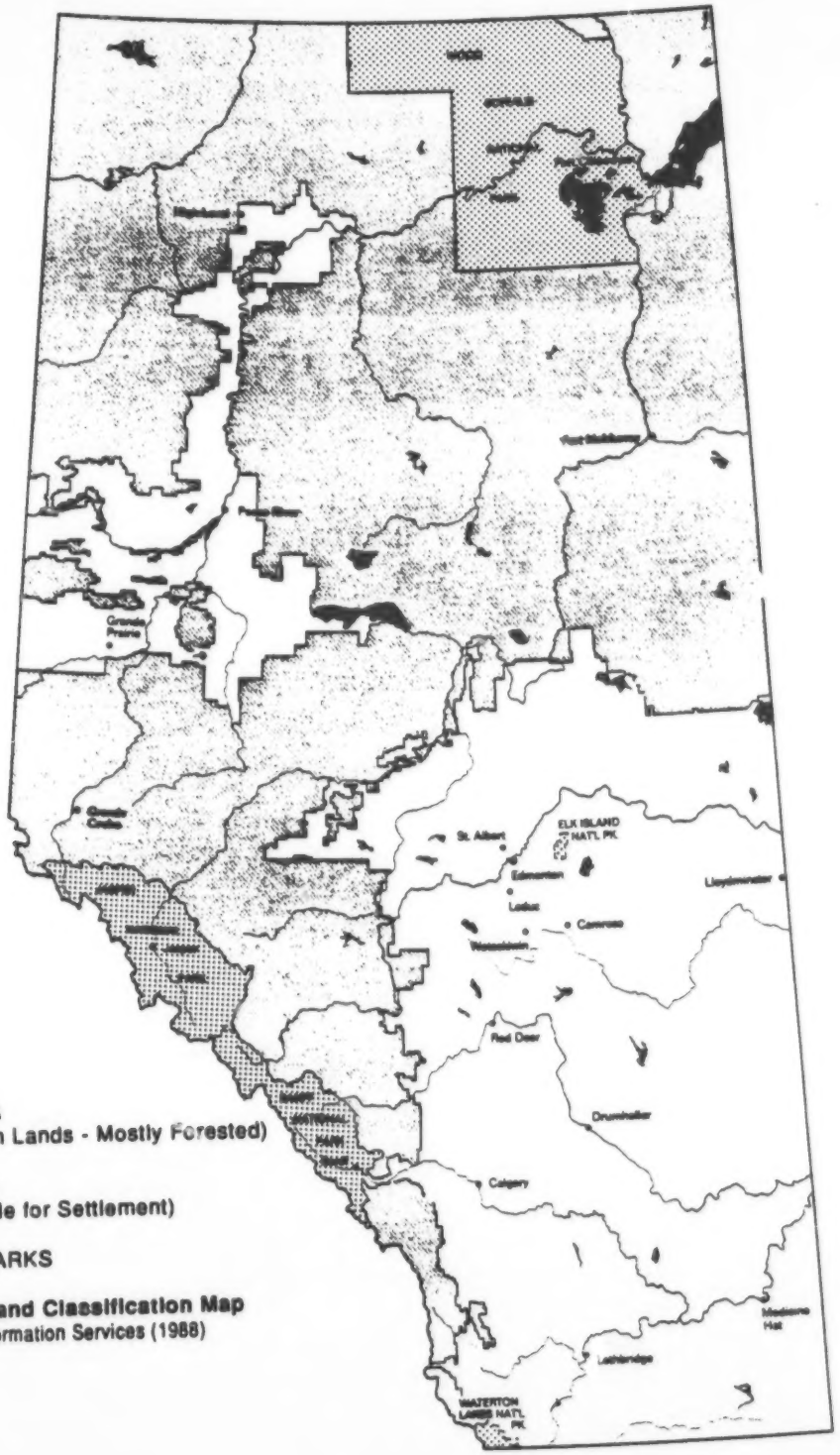
In 1930, jurisdiction for natural resources was transferred from the federal government to the province via the Alberta Natural Resources Act. Subsequent to this transfer, the Alberta Forest Service (AFS) was established as an agency of the Department of Lands and Forests.

In recognition of the need for a secure land base for forest management purposes, the Green Area was established in 1948 (Figure 1). The Green Area encompasses most of Alberta's public forest lands, and indiscriminate land sales or settlement of these lands is forbidden (McDougall 1986). Subsequently, various tracts of forest land within the Green Area were designated for purposes other than timber management. These forested lands include Willmore Wilderness Park, three wilderness areas, several provincial parks, ecological reserves, and natural areas.

The importance of the forests of the Eastern Slopes as the watershed for several major river systems was recognized early in Alberta's history. The Eastern Rockies Forest Conservation Board operated from 1948 to 1973 and provided a watershed protection policy and planning framework for the Eastern Slopes (Government of Alberta 1984). The Rocky Mountain Forest Reserve was formally established in 1964 to further protect the forest vegetation of this important watershed.

A significant advance in formal integrated forest land use planning came with the adoption of the Eastern Slopes Policy in 1977 (subsequently revised in 1984). This policy created a system of land-use zoning for public lands in the Eastern Slopes region of the Rocky Mountains. Subsequent requirements for more detailed planning in other regions led to the development of the province's Integrated Resource Planning System (McDougall 1986).

There were significant developments in managing the timber resource itself, in 1954 with the creation of Forest Management Agreements (FMAs), and in 1966 with the timber quota system. FMAs give the forest industry long-term tenure to manage the timber on a particular land base. The timber quota system provides industry with long-term rights to a proportion of the annual harvest within a management unit. Both systems are based on a sustained yield of timber



GREEN AREA
(Public, Crown Lands - Mostly Forested)

WHITE AREA
(Land Available for Settlement)

NATIONAL PARKS

Figure 1. General Land Classification Map
SOURCE: After Land Information Services (1988)

and have encouraged the development of the forest industry by securing timber supply, an important requirement for large-scale capital investment.

In more recent years, the Alberta government has responded to growing concern about the environmental impact of forest industry operations with two initiatives. First, in 1973, a study of the environmental impacts of timber harvesting was undertaken (C.D. Schultz and Company Ltd. 1973). A number of recommendations were subsequently incorporated in revisions to the operating ground rules for forestry companies. Four years later, the Environment Council of Alberta was asked to conduct public hearings on the environmental effects of forestry operations in Alberta. These hearings led to a series of recommendations concerning forestry operations (Environment Council of Alberta 1979), many of which were adopted by the Alberta Forest Service.

In 1979, a major seven-year provincial program in forest management was initiated, the Maintaining Our Forests Afforestation Program. Funded from the Alberta Heritage Savings Trust Fund, its prime objective was to restore the coniferous production lost to aspen competition, fire, and agriculture. This was done through land clearing, scarification, tree planting, and aerial seeding. This program was additional to the forest renewal activities of the Alberta Forest Service. Another important recent program was the Canada-Alberta Forest Resource Development Agreement 1984-1989. The major elements of this joint federal-provincial initiative were reforestation, forest resources research, forest products research and development, and public information.

The most significant developments in managing forests have occurred over the last 30 years. Achievements over this period include

- completion of three increasingly comprehensive timber inventories,
- adoption of a system of models for long-range timber supply planning,
- construction of the large, modern Pine Ridge Forest Nursery at Smoky Lake,
- development of a comprehensive forest renewal program,
- creation of a modern fire suppression system,
- initiation of an integrated resource planning process,
- adoption of guidelines for road planning, road construction, and logging operations.

These programs are described in more detail later in this report.

THE FOREST RESOURCE

Alberta's forests include a diverse range of ecosystems that provide for economic activities and other benefits such as logging, domestic grazing, trapping, hunting, fishing, wildlife habitat, recreation, and water supply. Some of these activities are compatible and some are not. Each depends on certain unique attributes of the forest resource. The wide range of these attributes makes simple descriptions of the resource base a particularly difficult task. For the purpose of this discussion paper, the resource base is described in two ways. First, Alberta's forested ecoregions are described. Second, the capacity for sustainable wood fiber production is described, with an overview of current timber supply cut and industrial commitments of the timber resource.

Forested Ecoregions

Of Alberta's twelve ecoregions, six are considered to be forested systems with continuous overstories (i.e. closed canopies). In decreasing order of size, they are the boreal mixedwood, boreal foothills, boreal northlands, boreal uplands, subalpine, and montane ecoregions (Table 1). The remaining ecoregions include the three types of grasslands, aspen parkland, alpine, and boreal subarctic.

The boreal mixedwood ecoregion (Figure 2a) is Alberta's largest ecoregion, representing about

43 percent of the province (Table 1). This region is in the northern half of the province with the exception of a broad strip along the North West Territories-Alberta border (Strong and Leggat 1981). Aspen is the dominant tree species. However, balsam poplar, black spruce, white spruce, and jack pine are also common. The modal ecosystem (the vegetation typical of moderately well-drained, medium-textured soils within the ecoregion) is characterized by aspen-white spruce mixes in varying proportions on moderately well-drained gray luvisol soils. Jack pine occurs on rapidly to well-drained sites and pure stands of white spruce and black spruce are found on imperfectly to poorly drained sites.

Table 1. Forested Ecoregions in Alberta

Ecoregion	Area (km^2)	% of Province
Boreal mixedwood	285,611	43.2
Boreal foothills	63,362	9.6
Boreal northlands	47,588	7.2
Boreal uplands	27,098	4.1
Subalpine	23,133	3.5
Montane	3,538	0.5
Non-forested ecoregions	210,603	31.9
Total	660,933	100.0

SOURCE: Strong and Leggat (1981)

The boreal foothills ecoregion occurs west of the boreal mixedwood ecoregion and parallel to the Rocky Mountains (Figure 2b). Generally, this ecoregion occupies similar terrain to the mixedwood ecoregion, but at a higher elevation. The modal ecosystem is represented by aspen-lodgepole pine tree associations on well-drained gray luvisol soils succeeding to white spruce. This region is generally wetter than the neighboring mixedwood region and contains some of the province's most productive forest sites (Strong and Leggat 1981).

The boreal northlands ecoregion is found in the far northern part of the province, much of it in Wood Buffalo National Park (Figure 2c). It is colder and drier than the boreal mixedwood. White spruce and aspen form mixed forests with the spruce being the dominant component. Jack pine is found on well-drained sites, whereas black spruce is common on poorly drained soils (Strong and Leggat 1981).

The boreal uplands ecoregion occurs in the west-central portion of the province. This ecoregion serves as a transition zone between the subalpine and boreal foothills ecoregions (Figure 2d). The boreal uplands ecoregion is different from the subalpine region because white and black spruce occur as climax species. Engelmann spruce and Engelmann-white spruce hybrids, together with alpine fir and alpine-balsam fir hybrids, are primary climax species in the subalpine ecoregion. The paucity of aspen in the boreal uplands ecoregion distinguishes this area from the boreal foothills region.

The subalpine ecoregion (Figure 2e) occurs in a band along the eastern slopes of the Rocky Mountains between 1520 and 2135 metres above sea level at the southern limits and between 1490 and 1975 metres above sea level at its northern limits. This ecoregion is bordered by the alpine forest at higher elevations and by montane or boreal uplands ecoregions at lower elevations. Two modal subregions characterize the subalpine region. Lodgepole pine on eutric brunisol soils is the representative species in the pine subregion and Engelmann-white spruce hybrids are representative in the spruce-fir subregion (Strong and Leggat 1981). Alpine fir, balsam fir, and their hybrids are also common in successionally mature stands (Corns and Annas 1986).

The montane ecoregion is restricted to the valleys and foothills of the Rocky Mountains (Figure 2f). It is distinguished by the presence of Douglas fir and/or limber pine, with white spruce

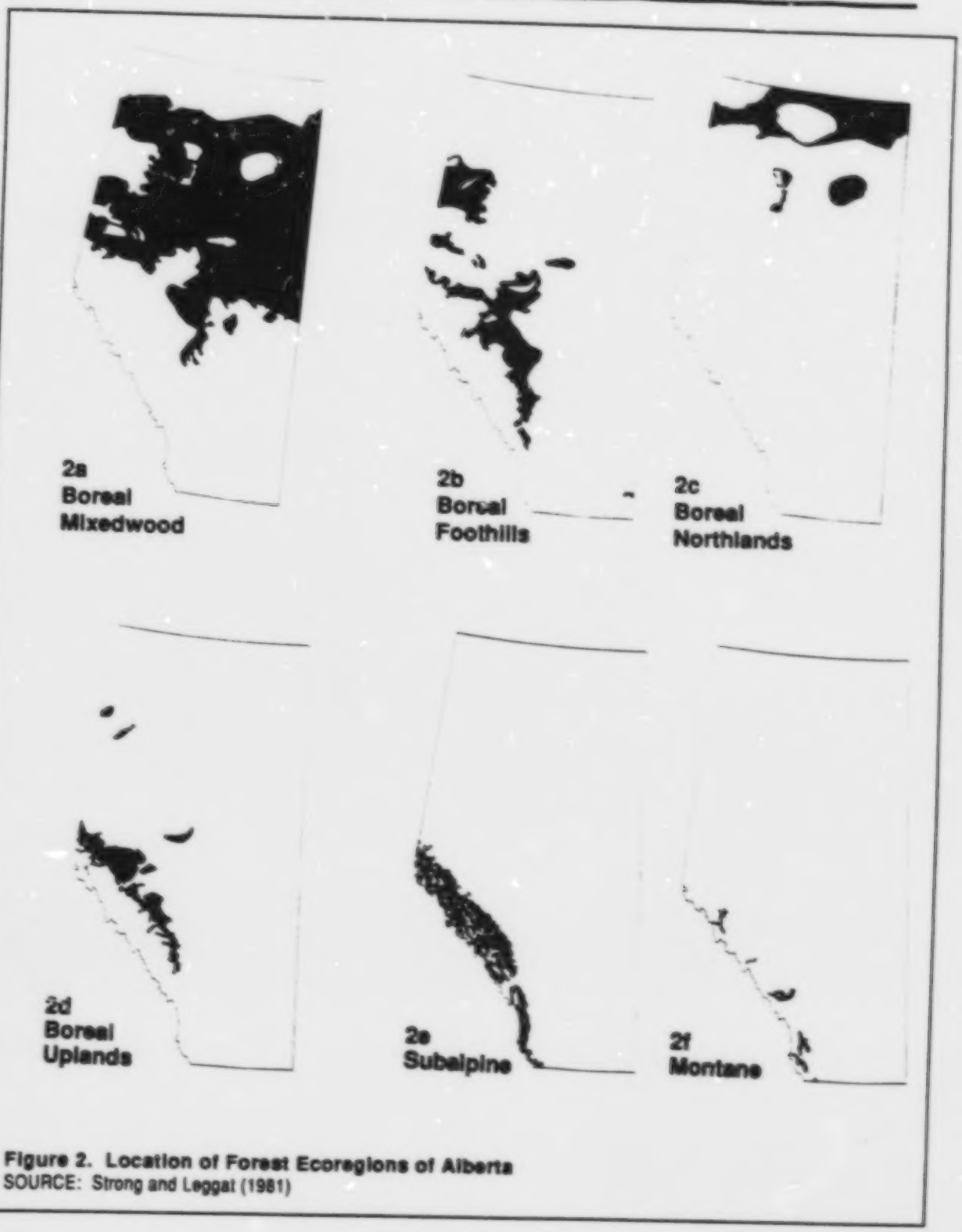


Figure 2. Location of Forest Ecoregions of Alberta
SOURCE: Strong and Leggat (1981)

and lodgepole pine being other important tree species (Strong and Leggat 1981). This region often escapes the coldest of winter weather, as warmer Pacific (chinook) winds are often channeled through these valleys.

Alberta's forested ecosystems are highly productive in their flora and fauna. Measurements of biological productivity have focused on one component — the timber resource. The timber productivity of sites in the forested ecoregions of Alberta varies widely (Table 2). On average, the boreal foothills ecoregion exhibits the greatest productivity. The boreal mixedwood, however, produces more merchantable timber by virtue of the region's larger size.

Table 2. Tree Productivity in Forested Ecoregions

Ecoregion	Productivity[a] (m3/ha/yr)	Merchantable Volume (m3)
Boreal mixedwood	1.1	1,357,263,000
Boreal foothills	1.8	1,224,864,000
Boreal northlands	0.9	171,922,000
Boreal uplands	1.6	1,135,231,000
Subalpine	1.3	136,201,000
Montane	1.3	153,008,000

[a] gross productivity of merchantable forest

SOURCE: Data provided by Alberta Forest Service (1990)

Sustainable Timber Supply

The term used to define the maximum permitted annual rate of timber harvest is the Annual Allowable Cut (AAC). Basically, the AAC is a measure of the annual rate of harvest that can be sustained on the land base, based on yield and management assumptions at the time of analysis. This rate is determined by the Alberta Forest Service, with the major exception of FMAs, where the AAC is calculated by the forestry company and confirmed by the Alberta Forest Service. A number of factors can affect the Annual Allowable Cut:

- new forested land areas on which timber cutting is prohibited (for example, when a new park is created)
- land use constraints
- the rate of loss to fire, and
- failure to realize expected growth rates in regenerated stands.

Due to the variable nature of these influences, the Alberta Forest Service occasionally re-evaluates AACs.

In accordance with the provincial government's policy of at least maintaining the existing yield of timber, the Annual Allowable Cut is not permitted to decrease through time. However, AACs can decrease over time if there are natural catastrophes such as fire and insect infestations which reduce the growing stock. Also, changes can result if the assumptions applied in the AAC analysis are revised (for example, rotation age, utilization standard, land base definition). The coniferous and deciduous AAC in the province stands at about 14.3 million cubic metres and 10.4 million cubic metres respectively. Approximately 96 percent of the coniferous AAC and 81 percent of the deciduous AAC is either allocated or provisionally committed as of April, 1990 (D. Price 1990; pers. comm.).

A CONTEXT FOR FOREST CONSERVATION

Alberta has already made progress toward sustained yield, multiple use, and good overall forest management. Some processes for considering different resource users in managing and allocating forest resources have been established, and a variety of attempts are being made to incorporate public input into decision making. Furthermore, programs to renew and protect forests have been implemented, and ground rules designed to minimize the impact of harvesting are in place. Although the system is far from complete, some

mechanisms to designate and protect certain areas from resource development do exist. Thus, with respect to forest management, some of the basic mechanisms required to meet the objectives of the Alberta Conservation Strategy are in place. However, the use of some of these mechanisms needs to be improved, and there is a continuing need to refine and improve policies, guidelines, and management philosophies as social priorities, technologies, and environmental and economic circumstances evolve.

Efforts are underway to improve forest management in Canada. In 1987, the Canadian Council of Forest Ministers (CCFM) endorsed a National Forest Sector Strategy for Canada. A task force with members from government forest services, private industry, universities, labor groups, professional foresters, and environmental groups drafted this strategy following a series of national consultations culminating in a major congress held in Saint John, New Brunswick. The strategy outlines many of the challenges facing the forest sector and includes recommendations as to how these challenges can be met. Included is a recommendation that members of the forest sector assist in the development of provincial conservation strategies (CCFM 1987). The Alberta Conservation Strategy can contribute to smooth transitions in the forest management arena by explicitly defining concerns and offering recommendations with respect to achieving an acceptable balance between forest conservation and wood fiber production.

Chapter Two

Administration Of Alberta's Forests

This chapter briefly describes the provincial government's approach to forest management through legislation, policies, and dispositions (an authorization in the form of a permit, licence, or other legal agreement) for timber harvesting. For a more thorough discussion of these topics, see Moen (1990).

ADMINISTRATIVE STRUCTURE

The Department of Forestry, Lands and Wildlife has primary responsibility for managing the public lands of Alberta. Three divisions within this department are the key resource management agencies: the Alberta Forest Service (AFS), the Fish and Wildlife Division, and the Public Lands Division. Although other divisions in this department are not directly involved in forest management, they do have an important influence. These include the Forest Industry Development Division and the Land Information Services Division.

The main focus of the Alberta Forest Service is on forest management, including timber harvesting, reforestation, livestock grazing, and outdoor recreation. The Alberta Forest Service issues dispositions and sets ground rules for timber harvesting. It approves company harvesting plans and promotes watershed protection. In cooperation with the Fish and Wildlife Division, the AFS also helps to manage wildlife habitat affected by timber harvesting. Forest fires, pest management, and control of surface activities related to petroleum and natural gas exploration and development are also responsibilities of the Alberta Forest Service.

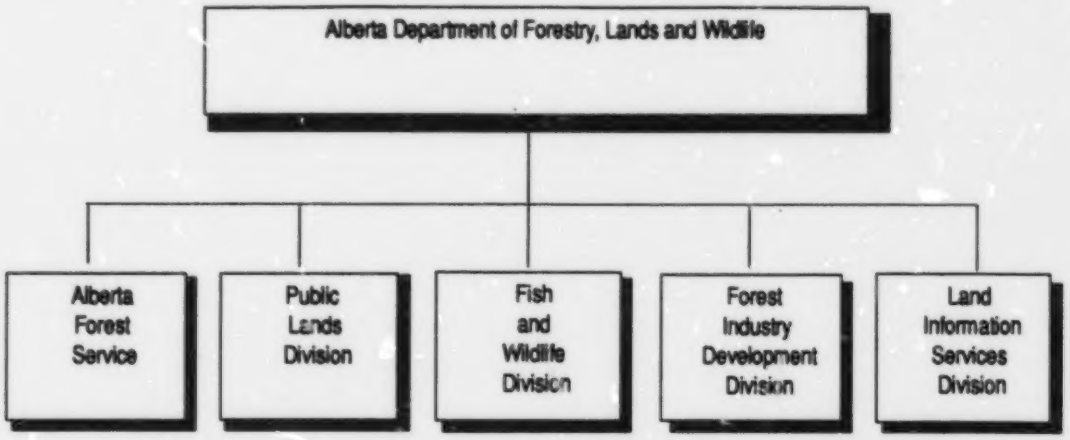
The Fish and Wildlife Division manages Alberta's fish and wildlife resources. This agency regulates hunting and fishing and manages habitat to benefit wildlife and fish. The Public Lands Division is responsible for most of the dispositions on Crown land. In the Green Area, these include dispositions for surface minerals such as sand, gravel, and clay. Although sub-surface minerals such as coal, metals, petroleum, and natural gas are controlled by the Department of Energy, surface dispositions related to their use are issued by the Public Lands Division. Various dispositions related to commercial and industrial developments, tourism, and recreation are also administered by the Public Lands Division.

The Resource Planning Branch, an agency within the Public Lands Division, provides information and planning for the integrated resource planning program used throughout the province (see Policies and Guidelines). Teams with representatives of interested government agencies, as well as local governments, industry, and public interest groups, co-operate to develop plans. These plans provide a framework for managing the resources of Alberta's Crown lands.

The Forest Industry Development Division assists companies and private investors in producing a variety of products from the forest. It seeks new markets and investment for Alberta's forest industry. The Land Information Services provides integrated inventory and mapping services.

LEGISLATION

Activities in Alberta's forests are subject to a variety of Acts and regulations. Of primary importance to the forest industry is the Forests Act and its associated regulations. This Act establishes


Alberta Department of Forestry, Lands and Wildlife
Alberta Forest Service
Public Lands Division
Fish and Wildlife Division
Forest Industry Development Division
Land Information Services Division

the provincial government's authority to regulate timber harvesting on public lands in Alberta. Timber Management Regulations provide further detailed information and outline the responsibilities of disposition holders. With respect to forest protection, the Forest and Prairie Protection Act establishes the authority and responsibilities for fighting forest fires and controlling forest pests.

Other forest activities are also regulated under the Forests Act. For example, the Forest Land Use Zone, Forest Recreation Area, and Forest Recreation Trail Regulation describes three types of forest areas in which motorized vehicles, camping, and other activities are managed and, in some cases, restricted. Forest land use zones have been established in Kananaskis Country and other areas in the Eastern Slopes.

Other legislation can also be used to designate special forest areas. The Forest Reserves Act permits the creation of forest reserves whose primary purpose is to conserve forest vegetation and protect important watersheds. It provides for the management of livestock grazing and the maintenance of rangelands. The Rocky Mountain Forest Reserve extends from the Cardinal River east of Jasper National Park south to Waterton Lakes National Park. The Wilderness Areas, Ecological Reserves and Natural Areas Act, as well as the Provincial Parks Act, have also been used to establish areas having varying degrees of protection from disturbances and restrictions on activities.

DISPOSITIONS

The primary method for regulating commercial activities on public lands is through dispositions. Timber dispositions are issued by the Alberta Forest Service and include Forest Management Agreements, quota certificates, timber licences, commercial timber permits, and local timber permits.

About half of the timber harvesting in Alberta is conducted under the authority of quota certificates and timber licences. For each forest management unit established by the government, an Annual Allowable Cut is determined, based on maintaining a sustained yield of timber from that unit. Timber quotas are assigned to commercial operators, giving them the right to harvest a certain portion of that allowable cut. These quotas are valid for a 20-year renewable term. The quotas do not identify which timber is allocated to the

ALBERTA FOREST SERVICE DISPOSITIONS

- Forest Management Agreements
- Quota Certificates
- Timber Licences
- Commercial Timber Permits
- Local Timber Permits

operators; instead, short-term timber licences are issued to the quota holders by the AFS according to the timber management plan developed for each forest management unit. Large quota holders are required to reforest the cutblocks they harvest. Smaller operators have the option of reforesting or they can pay a fee to have the government do it.

Commercial timber permits are issued for one- to three-year terms where a surplus Annual Allowable Cut exists in a forest management unit. Local timber permits are generally issued to local residents from Miscellaneous Timber Use areas set aside within certain forest management units to provide a sustained supply of timber for local use or sale. These permits are valid for up to one year.

Forest Management Agreements (FMAs) are perhaps the most comprehensive disposition offered for timber harvesting. These are 20-year renewable agreements that give a forestry company harvesting rights over extensive areas of commercial timber at specified dues and rates, and under specific conditions. In return the company builds and operates a permanent wood-processing plant, such as a pulp mill or sawmill, and agrees to manage the timber resource on a sustained-yield basis while recognizing other land uses. Harvesting and management plans must first be approved by the Alberta Forest Service and the company is responsible for reforesting the harvested cutblocks.

Other commercial activities in our forests also require dispositions. Grazing allotments for domestic livestock within the Rocky Mountain Forest Reserve are managed under the Forest Reserves Act. Outside of this reserve, grazing leases, permits, and licences are issued under the Public Lands Act. Registered Trapping Areas have been established throughout our public forests and the number of registered trappers working these areas is regulated. Some recreational activities are also regulated. Permits are required for commercial trail riding operations, and hunting and fishing regulations limit the harvest of the forest's fish and wildlife.

Surface mineral leases are required for access to sand, clay, and gravel deposits. These leases are also needed for developing energy resources such as oil, gas, and coal, with additional permits and licences issued by the Department of Energy and the Energy Resources Conservation Board. Activities that involve extensive land surface disturbances often require special licensing, monitoring, and reclamation under the Land Surface Conservation and Reclamation Act. In addition, this Act provides authority for the Minister of Environment to require an environmental impact assessment on a wide range of resource development activities.

THE REFERRAL SYSTEM

Applications for the industrial use of public lands are received by the Department of Forestry, Lands and Wildlife. In order to ensure that the implications for other resource uses are considered, these applications are circulated to other government departments and agencies for their comments. A specific referral system exists for most application types. For example, an application for

a timber permit being processed by the Alberta Forest Service would be referred to the Regional Habitat Biologist of the Fish and Wildlife Division. This interagency referral system is an important component of resource management on Alberta's public lands.

POLICIES AND GUIDELINES

In addition to legislation and licensing, the government has certain policies that significantly influence the management of Alberta's forests. The Eastern Slopes Policy, for example, provides direction for resource management in the Eastern Slopes region. According to this policy, the provincial goal for timber resources is "to provide the optimal continuous contribution to the economy by the forest-based industries consistent with sound environmental practices recognizing other uses of the forest" (Government of Alberta 1984:2). The Eastern Slopes house the headwaters of several very important river systems, including the Athabasca and the North and South Saskatchewan rivers. The highest priority for resource management in the Eastern Slopes has been placed on watershed management.

The Eastern Slopes Policy identifies different land use zones throughout the region. The policy designates Prime Protection, Critical Wildlife, Multiple Use, Industrial, General Recreation, Special Use, and Facility zones. For each zone, there are guidelines for permitted and restricted activities, including logging, domestic grazing, intensive recreation, mineral exploration and development, and wildlife management.

This zoning system has been adapted to other public lands through a system called Integrated Resource Planning. For a given planning area, a planning team is established, consisting of staff from several government agencies involved in resource management, such as the Alberta Forest Service, Public Lands Division, Fish and Wildlife Division, Department of Agriculture, Department of Energy, Department of Environment, and others. The composition of the planning team varies from area to area, depending on the resources and issues involved. This planning team produces a set of goals and objectives for resource management in the area and delineates zones on a map indicating where certain uses will have priority. These uses include recreation, agriculture, wildlife habitat, multiple use, and others. A secondary group is consulted during this process, including other government agencies, public interest groups, MLAs for the area, and others. Local public meetings are held and information about the plan is distributed through newsletters. The final plan is considered for approval by the provincial Cabinet. Once finalized, the plan guides government personnel as they make resource management decisions and issue dispositions for activities, such as timber harvesting, mining, and recreation.

In addition to the policy of integrated planning and management, the government has also issued guidelines for industrial operations in the Green Area of the province. These include:

1) the Resource Handbook which outlines basic requirements for mineral exploration and resource development (Alberta Forest Service 1979)

2) specific guidelines for road planning and culvert sizing for stream crossings (Fisher 1982; Anderson and Asquin 1986)

3) provincial ground rules for timber harvesting, which outline the requirements for designing cutblocks and cutting systems as well as considerations in road construction, reforestation to protect watersheds, and wildlife habitat protection (Alberta Forest Service 1986a)

4) the Forest Landscape Management Guidelines, which seek to improve the visual appearance of timber harvesting operations and other industrial activities (Alberta Forest Service 1986b).

These guidelines clarify the standards of operation that resource industries are expected to meet under normal circumstances. Modifications to these guidelines are possible when site conditions warrant special consideration. Monitoring industrial activities in the field is very important if these guidelines are to be effective.

PUBLIC INPUT

The public is allowed to comment on forest management through several means, with varying degrees of success. During the preparation of Integrated Resource Plans, open houses are held in the planning area to familiarize local residents with the planning process and to solicit their input. Draft plans are circulated for public comment at various stages. The final plans indicate where various resource-related activities, including timber harvesting, are compatible with the desired mix of uses of public lands in the area.

One area of forest management in which public input is sought relates to the use of pesticides, including forest insecticides and herbicides. Open houses are held for local residents when applications of pesticides to areas greater than 20 hectares in size are proposed. If approved, advance notice of the spraying is given in local newspapers.

There is concern among some non-government organizations and the general public that the policies for public input are weak and poorly defined.

Until recently, public input related specifically to timber management planning has been rather limited. Negotiations with forestry companies for Forest Management Agreements (FMAs) have been conducted largely in secret, with details being announced following selection of a company and agreement in principle on the project. While some degree of confidentiality may be necessary, the need for broader public consultation was evident following the announcements of several new major pulp mills and sawmills in 1986-88. It appeared that several important decisions concerning a large area of northern Alberta had been made with little public consultation. New environmental organizations and citizen coalitions formed in response to these forestry proposals.

In December of 1988, the government announced a new policy to include the public in FMA planning activities. Local citizens will be given the opportunity to comment on the timber management plans developed by FMA holders. In addition, a series of meetings was held in communities across northern Alberta to provide information about forest management and the new forestry developments. Public concerns expressed at those meetings have been reviewed by an independent panel of forestry experts and are reflected in their recommendations to the Minister of Forestry, Lands and Wildlife (Expert Panel on Forest Management 1990).

More recently, the federal government joined with provincial authorities in conducting a joint environmental impact assessment of the proposed Alberta-Pacific pulp mill on the Athabasca River. The Alberta-Pacific Environmental Impact Assessment (EIA) Review Board also considered the cumulative effects of pulp mills on the Peace and Athabasca rivers, as well as timber harvesting as it affects native Indian lands. This provided another opportunity for public discussion of these projects. The Review Board's report was released in March, 1990.

There is concern among some non-government organizations and the general public that the policies for public input are weak and poorly defined. To date, it appears that some of the opportunities for public input have come late in the process, after some important decisions had already been made. There is still no public input to the Forest Management Agreements, only to the harvesting plans once the agreement is signed. Public consultations for major forestry projects

have focused on local residents, and many forest users and interested Albertans feel excluded from the process. The adequacy of the new public consultation processes has yet to be determined.

Some of these concerns appear justified. In their report, the Alberta-Pacific EIA Review Board made several recommendations to improve the public consultation process (Alberta-Pacific EIA Review Board 1990). When an EIA is required, they urged that it be made clear that a decision on the project will not be made prior to the completion of the EIA process. They argued that Forest Management Agreements and the associated processing plant or mill should both receive formal public input prior to approval. The Expert Panel on Forest Management (1990) agreed that both timber management and mill operations should be considered in the same public hearing process.

Further improvements in public consultation for forestry projects are needed.

Chapter Three

Management of Alberta's Forests

INTRODUCTION

There are many responsibilities associated with the management of Alberta's forests. Some examples include: stand tending, development of recreation facilities, integrated planning, timber inventory, wildlife habitat enhancement, establishing and enforcing ground rules for resource use, control of insects and diseases, determining sustainable rates of use, forest reclamation, and public access. This chapter focuses on the principal management functions of timber harvesting, reforestation, fire prevention, and research. As the agency designated to manage public lands in the Green Area, the Alberta Forest Service (AFS) plays a fundamental role in all of these areas through program delivery or monitoring and enforcing policies and standards.

HARVESTING

Most timber harvesting activity in Alberta takes place during the winter months. Many areas are wet and access can be very difficult during the summer. Damage to the soil is much reduced when the ground is frozen. However, better road construction techniques and new harvesting equipment designs reduce some of these problems and summer harvesting is becoming more common.

Both manual and mechanical methods of tree cutting are used in Alberta. Chainsaws are used in handfelling trees for small sawmill operations, and larger mills also use handfelling where mechanical harvesting is impractical. Feller bunchers, delimbers, and other heavy machinery are used for mechanical harvesting. These machines cut the trees, delimb them, and stack them in a pile. Logging trucks transport the logs to the mill, where they are debarked, sawn for lumber, peeled for veneer, or chipped for pulp or panel board products.

In Alberta, as in most provinces, clearcutting is the strategy used for timber harvesting. All large trees in the block are cut, but a few individual trees are sometimes left; for example, mature aspen may be left standing in a coniferous cutblock. However, isolated trees are very prone to "windthrow" and eventually fall over. Scarification (the use of heavy machinery to break up the ground surface and expose the mineral soil prior to replanting) usually removes any remaining trees. With the increasing use of aspen, mixed stands may be cut twice, once for the conifers and again for the aspen.

An area is usually clearcut in two stages. Half of the merchantable timber in an area designated for harvest will be cut in a patchwork pattern, alternating between cutblocks and leave blocks of similar size. The leave blocks are harvested in the second stage, ten to twenty years later when the first-pass cutblocks have been reforested and the new trees have reached a height of two metres for coniferous trees or three metres for deciduous trees.

The size of these cutblocks varies, but maximum sizes have been set in the government's timber operating ground rules (Alberta Forest Service 1986a). For pine and aspen blocks, the cutblocks must average no more than 60 hectares, but may range up to 100 hectares in size. Spruce blocks can be harvested in 24-hectare patches or 32-hectare strips. There is some al-

lowance for larger spruce cutblocks depending on the distance to a seed source or the commitment of the operator to replant. Cutblock patterns often follow natural terrain features, contours, and timber type boundaries, to minimize impacts on aesthetics, risk of blowdown, and surface runoff, and to benefit some wildlife species, reforestation, and the logistics of harvesting. Cutblock design is a compromise among these various factors and economic considerations.

Another system of harvesting promoted by some people is selective harvesting. This method of timber harvesting is used in managing uneven-aged forests. Only selected trees are cut at any one time, and the remaining trees are allowed to continue to mature and produce seed. Selective harvesting can also refer to commercial thinning operations where selected trees are removed to reduce intertree competition while providing usable intermediate wood volumes.

REFORESTATION

The prompt restocking of harvested sites is fundamental to the sustained yield forest management concept. The reforestation program in Alberta is among the most comprehensive in Canada. Over the 11-year period from 1975 to 1985, 274,026 hectares of forest were harvested in Alberta (Kuhnke 1989). This is 1.3 percent of the 21 million hectares of productive timber land in the province. Of this harvested area, about 36 percent was planted with seedlings, 27 percent was directly seeded, and the remaining 37 percent was left to seed in naturally (Kuhnke 1989). This natural reforestation is often assisted by preparing the site. The success rate for establishing a new crop of trees has been high. Over 96 percent of all cut-over areas (10 years or older) have met provincial restocking standards (Drew 1988). However, re-establishing a new crop does not guarantee satisfactory reforestation, as competition from other vegetation has been found to substantially reduce the yields of the new coniferous crop at some sites (see Chapter Seven).

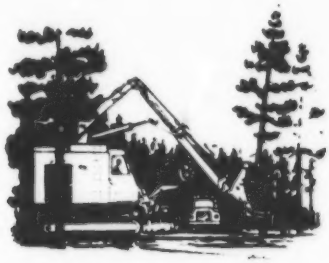
Figure 3 demonstrates the various types of activities associated with reforestation. The particular prescription adopted depends on a number of factors, including topography, soil, moisture regime, logging debris, and the cover type at the time of harvest (Alberta Forest Service 1983).

The responsibility for reforestation is divided between the Alberta Forest Service and Alberta's forest industry. The forestry company's liability depends on the type of disposition under which they operate and/or the volume of timber harvested. Forestry companies holding Forest Management Agreements or large quotas (in excess of 200,000 cubic metres of timber per year) are responsible for reforestation of all cut-over areas to provincial standards. Quota holders with fewer than 200,000 cubic metres per year have the option of regenerating their own sites or paying a reforestation levy to the government which, in turn, accepts responsibility for reforesting the sites. For Commercial Timber Permits and Local Timber Permit holders, a reforestation levy is charged to all operators and the Alberta Forest Service assumes complete responsibility for reforestation. Reforestation levies are listed in Table 3.

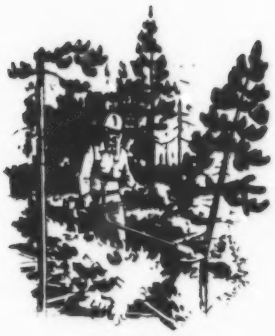
Table 3. Reforestation Levies

	Reforestation Levy ($/m^3)	
Disposition	**Coniferous**	**Deciduous**
Quota < 200,000 m^3 and > 10,000 m^3	3.25	0.25
Quota < 10,000 m^3 Commercial Timber Permit	2.50	0.25
Local Timber Permit	1.60	0.10

SOURCE: Alberta Forest Service (Sept. 1990)



Harvest of the Mature Forest
Trees are harvested at maturity or salvaged after fires.



Stand Tending and Maintenance
This may include control of unwanted vegetation, thinning and fertilization to help the stand reach maturity as soon as possible.

Reforestation

Post Harvest Management
This determines the methods to be used to achieve reforestation.

Regeneration Stands
— monitoring growth

Site Preparation (Scarification)
This exposes soil for seed or planting and removes unwanted vegetation.

Planting or Seeding
Planting by hand or seeding from helicopters may be done depending on the site requirements.

Figure 3. Reforestation
SOURCE: Courtesy of Alberta Forestry, Lands and Wildlife Program Support Branch

Most seed and seedlings used for reforestation in Alberta are provided by the Alberta Forest Service's Pine Ridge Forest Nursery located near Smoky Lake. This large, modern facility will be a major factor in the success of Alberta's forest renewal program, with an annual capacity of 24.5 million container and bare root seedlings. In addition, over nine million seedlings are supplied by timber companies and commercial tree nurseries.

The goal of reforestation in Alberta is to grow new forests that replicate or exceed the yields of natural forests managed for timber production. Reforestation standards in Alberta (pursuant to the Reforestation Regulations of the Forests Act) describe the statutory requirements for regenerating harvested cutblocks. These regulations were recently revised to reflect the new interest in harvesting deciduous and mixedwood forests and to address some problems with current coniferous regeneration. The new regulations set standards for the stocking rate, density, and height of acceptable coniferous and deciduous species. For conifers there is an additional requirement that they be "free-to-grow," that is, unimpeded in their ability to grow above competing vegetation.

Cut-over sites must receive appropriate treatment within two years following harvest. Two independent surveys of the new forest, an establishment survey and a performance survey, are required to evaluate the success of the initial and subsequent treatments.

The establishment survey is conducted four to eight years after harvest of a coniferous or mixedwood site or three to five years after harvest of a deciduous site. It evaluates stocking rate, density, and early growth of the new timber. Areas that do not meet the reforestation standards must be retreated and resurveyed until they are acceptable.

The second survey — the performance survey — is conducted on coniferous and mixedwood sites eight to fourteen years after harvest. This survey reevaluates adequacy of stocking, density, and height to determine whether the crop trees continue to grow satisfactorily. Areas that are not satisfactory must undergo further treatment to bring them up to standard.

FIRE PREVENTION

Although fire is a natural element in the forest ecosystem, the net effect of wildfire on timber production is negative. Thus, the reduction of losses to wildfire is a key timber management goal and an important consideration in determining sustainable yield. Some positive effects of fire are being recognized and "prescribed burns" are being used to enhance wildlife habitat.

Responsibility for fire prevention in Alberta is delegated to the Forest Protection Branch. The forest industry is, however, required to provide supplemental support by (a) providing equipment, (b) training, drilling, and providing personnel for fire control as required, and (c) providing duty rosters during the fire season. In addition, the forest industry is assessed an annual per-hectare fee for protection. Principal fire management program activities include prevention, detection, pre-suppression (preparedness, initial attack, and hazard reduction), and suppression.

FOREST RESOURCES RESEARCH

In Canada and Alberta, research is carried out on many different aspects of forestry: timber management, forest products, other forest resources, and so on. There are three national private research institutes financially supported by the federal and provincial governments and the forest industry. The Forest Engineering Research Institute of Canada (FERIC) conducts studies on harvesting and silvicultural equipment. Another institute, Forintek, conducts research on wood products, and the Pulp and Paper Research Institute of Canada (PAPRICAN) focuses on research related to pulp and paper manufacturing.

Forestry research in Alberta is conducted by individuals, corporations, colleges and universities, and government agencies. The principal source of relevant research conducted at the University of Alberta is the Forest Science Department. Numerous other faculties, departments,

and institutes at the University also conduct research related to forestry and forest ecosystems. Some examples include the Northern Institute of Boreal Studies, the Department of Zoology, the Department of Plant Science, the Department of Soil Science, and the Department of Rural Economy. Research conducted at the University tends to be oriented to basic or pure science.

Forestry Canada's research in Alberta is provided through the Northern Forestry Centre in Edmonton. The general nature of the research done at the Northern Forestry Centre bridges the gap between technically oriented research and purely scientific research.

Within the Alberta Forest Service, the Forest Research Branch and the Reforestation and Reclamation Branch are responsible for research and development. The focus is on operational problems. The Forest Research Branch also administers the Forest Development Research Trust Fund. The Forest Industry Development Division of the provincial Department of Forestry, Lands and Wildlife supports a variety of research projects, on forest products, marketing, equipment, and so on. Forest products research is conducted primarily by the Alberta Research Council and a few private companies. Much work has gone into new panel products and products using aspen.

A large proportion (63 percent) of the recent Canada-Alberta Forest Resource Development Agreement was devoted to research and development. This agreement, however, expired on March 31, 1989 and a significant downsizing in research and development capability in Alberta is expected.

Due to the recent expansion of the forest industry in Alberta, the need for a greater commitment to all forms of forest resources research and development is particularly acute. This need was evident to the Alberta-Pacific EIA Review Board. It recommended that several environmental studies be completed before any new pulp mills are approved for the Athabasca River (Alberta-Pacific EIA Review Board 1990). In general, forest research priorities should include: enhanced wood supply (for example, reforestation standards, management and use of aspen and mixed stands, and growth and yield of managed stands), forest protection (for example, fire and pest management guidelines, and evaluating the impacts of climatic change), wildlife inventories, ecological studies, and integrated resource management methods.

The Alberta Forest Research Advisory Council, reporting to the provincial Minister of Forestry, Lands and Wildlife, has been established to coordinate research activities in Alberta. The 16-member council comprises senior managers representing the forest industry, the provincial government, the federal government, the University of Alberta, and the Alberta Research Council. Non-government organizations and members of the public are not represented on the research advisory council. Their inclusion could help disseminate information to the public and give other forest users and taxpayers the opportunity to participate in the setting of forest research priorities on public lands.

Other research projects (both basic and applied) that are forest related, in such fields as wildlife and fisheries biology, wetlands ecology, ecosystem dynamics, and soil microbiology are being conducted throughout the province and Canada by a variety of individuals and groups. There is a need for the research findings from all forest and forest-related sectors to be incorporated into a data bank that can provide a broad and current information base for informed forest management decisions by all forest users.

Chapter Four

Economic Activity In Alberta's Forests

INTRODUCTION

An understanding of the various environmental and socioeconomic costs and benefits of developing the province's forest resources will be important in the preparation of an Alberta Conservation Strategy. Since logging and its associated industries have become a major factor in Alberta's forests, both economically and ecologically, the role of this forest industry is the main focus of this chapter. Other forest uses are briefly addressed here, but they are considered in more detail in other discussion papers in this series (see Appendix 1).

THE FOREST INDUSTRY DEFINED

A wide variety of industries rely directly or indirectly on wood fiber. For the purpose of this document, the forest industry includes all firms involved in the harvest and transport of timber and in the further processing of timber at the primary manufacturing level. This includes independent log producers and logging contractors; sawmills and planer mills; pulp and paper mills; veneer and plywood plants; and oriented strand board, medium-density fiberboard, and wood preservation plants.

CHARACTERISTICS OF THE ALBERTA FOREST INDUSTRY

Based on total industrial timber harvest in 1985, Alberta's forest industry ranked fourth in Canada, following British Columbia, Quebec, and Ontario (Table 4). This has not always been the case. Alberta's position in the national forest sector has grown dramatically in the past 15 years. In 1970, the Alberta forest industry accounted for 3.4 percent of the national harvest. In 1985, the proportion had increased to 5.5 percent. Since the province is one of the few regions with significant amounts of unallocated, exploitable timber, the proportion of the total national harvest accounted for by Alberta producers will likely increase.

Table 4. Industrial Timber Production, 1985

Province	Timber Production (m^3) (thousands)
British Columbia	70,868
Quebec	2,843
Ontario	26,060
Alberta	8,880
New Brunswick	7,568
Nova Scotia	3,144
Saskatchewan	2,868
Newfoundland	1,992
Manitoba	1,593
Prince Edward Island	128
Total	161,884

SOURCE: Canadian Forestry Service (1988)

The Alberta forest industry is very diverse. Firms range from small, unincorporated, part-time sawmill operations producing for local markets to large international conglomerates producing for international markets. A recent

survey showed that there are at least 160 small (producing less than 1 million board feet[1]) stationary sawmills and 48 portable sawmills in the province (Bamsey 1988). Although their contribution to total output is minor, they are important to local economies for three reasons. First, they are an important source of supplementary income for part-time independent operators, such as farmers. Second, they are a source of low-cost lumber for local residents and industries. Third, they are better able to use isolated tracts of timber that may be considered uneconomical by larger operators. Small sawmills clearly play a valuable role in rural economies. However, because this report focuses at the provincial level, it deals only with large sawmills (producing more than 1 million board feet per year).

Alberta's forest industry comprised 61 major industrial plants in 1987. Specifically, the industry included: 51 large sawmill /planer mills, two pulp mills, and eight panel producers (Bamsey 1988). There were also several paperboard plants, wood preservation plants, and mills producing poles, posts, and other wood products. Since 1987, three new large sawmills and four pulp mills have come into production and the two existing pulp mills have undergone major expansions. As well, other pulp mills, paper mills, and new or expanded sawmills have been proposed or are under construction.

Total forest industry production in 1987 and its approximate market distribution is shown in Table 5. The estimated market value of this production was over $1 billion. Over three quarters of these revenues were generated from the sale of products to out-of-province markets. Softwood lumber and bleached kraft pulp are Alberta's most important wood products. The primary destination for these products is the United States market, although several of the proposed pulp mills will be selling to the Pacific Rim. The ability of Alberta producers to compete in the United States market is due primarily to the high quality of Alberta products and the relative cost competitiveness of Alberta producers.

Alberta's spruce-pine-fir lumber is known for its consistent high quality. Features such as strength, ease of handling, low weight/volume ratio, straight grain, and attractive coloring make Alberta lumber a highly marketable product. Alberta's softwood bleached kraft pulp is also considered to be a high-quality product. The strength and brightness of Alberta kraft pulp is largely due to the spruce and pine species available.

Features such as strength, ease of handling, low weight/volume ratio, straight grain, and attractive coloring make Alberta lumber a highly marketable product.

With respect to costs, the main disadvantage of Alberta producers is lack of access to tidewater and the long overland distances to markets. This disadvantage, however, is more than offset by a number of advantages including low wood costs, low energy costs, the employment of state-of-the-art production technology, a highly integrated industrial structure, and other factors such as a stable and skilled work force and secure wood supply.

Delivered wood costs for Alberta producers are low and will remain so for a number of reasons. First, the Alberta terrain is relatively uniform. Second, access into the forest zone is well developed, due to oil and gas exploration activity. Third, volumes per hectare on Alberta's stocked, productive forest lands are among the

1 One board foot = 1 ft. x 1 ft. x 1 inch.

Table 5. Estimated Production and Market Distribution, 1987

Product	1987 Production	Estimated Market Distribution: Domestic %	United States %	Offshore %	Value (Cdn $) (million)
Dimension Lumber and Boards	1,500 million board ft.	40	57	3	320
Bleached Kraft Pulp	500,000 tonnes	0	98	2	410
Panel Products Construction Paper	40,000 tonnes	82	18	0	n/a
Insulation Board (1/2")	65 million sq. ft.	100	0	0	n/a
Plywood (3/8")	230 million sq. ft.	100	0	0	90
Oriented Strand Board (3/8")	600 million sq. ft.	40 [a]	60 [a]		200
Medium-Density Fiberboard	50 million sq. ft.	n/a	n/a	n/a	10
Treated Wood Products	200,000 cubic metres	100	0	0	n/a

[a] estimates
n/a not available

SOURCE: Data supplied by Alberta Forest Service

highest in Canada, ranking second only to British Columbia (Table 6). Fourth, Alberta's commitment to forest fire control and reforestation bodes well for security of wood supply for future use. Finally, the stumpage fee charged to the company is relatively low.

The favorable investment climate has resulted in considerable commitment of private

sector capital to forestry operations over the past 30 years. In particular, Alberta's system of tenure (for example, FMAs and quotas) has provided conditionally secure access to timber reserves, thereby eliminating the investment risks associated with short-term disposal systems. The result is a number of world-scale production facilities using state-of-the-art manufacturing technology. For example, in the sawmill industry the trend has been to construct larger, more capital intensive plants. In 1979, output of lumber per mill for large sawmills averaged 13 million board feet per year (Ondro et al. 1980). By 1985, average yearly production per mill had more than tripled to 42 million board feet (Bamsey 1987). The productivity of labor also increased dramatically during this period. In 1980, lumber production per person-year was 231 thousand board feet. In 1985, 335 thousand board feet of lumber were produced per person-year. The downside of improved productivity is fewer jobs per unit of production.

A number of firms in the Alberta forest industry are multi-plant enterprises that include sawmills, pulp mills, and paper mills. De-inking plants for recycling paper may soon be added to this list. The economic advantages of industrial integration include economies of scale, more efficient resource utilization, greater security in raw material supply, greater economic stability for firms (for example, less dependence on single commodities), and greater capacity for generating capital. The integrated industrial structure of Alberta producers gives the province a competitive advantage in global forest products markets.

SOCIOECONOMIC IMPACT OF THE FOREST INDUSTRY

The forest industry provides alternative economic opportunities within an Alberta economy now dominated by energy and agriculture. This chapter considers the socioeconomic contributions of the forest industry to the Alberta economy, although this single criterion cannot fully capture the industry's contributions. Aspects considered here include direct employment generation, community dependence, and export values.

Alberta's primary forest products industry generated over 10,000 person-years of direct employment in 1987 (Bamsey 1988). Much of this (57 percent) was permanent employment and the rest was contract (23 percent) or seasonal work (20 percent). Bamsey (1988) reports that 69 percent of the work is associated with the mills and lumber hauling, with 23 percent associated with the woodlands operations. Additional direct employment was generated for site preparation,

Table 6. Provincial Timber Supplies, 1986

Province	Volume (m^3) (millions)	Area (ha) (millions)	Stand Density (m^3/ha)
British Columbia	8,867	45.05	196.8
Quebec	4,225	49.57	85.2
Ontario	3,529	32.69	108.0
Alberta	2,656	19.08	139.2
Saskatchewan	905	13.32	67.9
Manitoba	680	12.62	53.9
New Brunswick	571	5.68	100.5
Newfoundland	525	7.63	68.8
Nova Scotia	244	3.25	75.1
Prince Edward Island	26	0.25	104.0

SOURCE: Canadian Forestry Service (1988)

tree planting, fire control, nursery operations, inventory, timber management, and in the administrative and program support operations of the Alberta Forest Service.

Large mills generally operate all year, whereas the woodlands operations are more seasonal. Much of the harvesting is done during the winter months when heavy machinery can travel over frozen ground. Most reforestation work takes place during the summer. Opportunities for seasonal employment in forestry complement other seasonal industries such as farming, trapping, and some tourism.

The forest industry has become a mainstay of the economic activity in a number of Alberta communities. Some of the larger population centers with a high degree of dependence on the industry include Grande Prairie, Hinton, Slave Lake, High Level, Whitecourt, High Prairie, and Fox Creek. These communities combined have a population of over 50,000 persons.

Forestry is also important to Alberta's native community. It has been estimated that there are over 200,000 hectares of forested Indian lands in Alberta (Kumar 1987). Some bands sell the standing timber to outside operators or fell the trees themselves and sell the logs. Bands have also established their own commercial sawmills and manufacture lumber, posts, poles, rail ties, and firewood. If timber on the reserve cannot support a commercial forest operation, Indian bands can expand their forest base by accessing provincial Crown timber through normal timber dispositions. In addition to benefits from commercial operations on native lands, the forest industry offers off-reserve work for natives. Harvesting, reforestation, stand thinning, road construction, and manufacturing require a large labor force. Many natives are hired to fight forest fires as well.

It is important to recognize that the value of the forest ecosystem to the native community is far more than simply the commercial forest value. Natives have a spiritual tie with the forest, which obviously implies that they value forests highly. They also rely heavily on hunting, fishing, trapping, and gathering for food and other necessities.

FOREST INDUSTRY DEVELOPMENT IN ALBERTA: GOALS AND STRATEGIES

The Government of Alberta is determined to encourage and facilitate investment in the forest sector as one element of a strategy to diversify the Alberta economy. The creation of the Forest Industry Development Division is evidence of this commitment. In April, 1987, the Honorable Don Sparrow (who was the Minister of Forestry, Lands and Wildlife at that time) discussed his department's main objective:

> *I've been given one goal by the premier. The opportunity is there to double the output of the forest industry. I guess that is our goal and I think it's achievable. It might not be in the lumber business, because we're concentrating on the pulp side. But the pulp expansion would automatically help the sawmills because we have an over supply of chips* (MacDonald 1987:4).

To achieve this goal, considerable private-sector investment is required. To date, the province has relied on two principal methods for attracting investment capital. First, the Province has actively promoted industrial development by identifying "potential" development areas and providing solicited and unsolicited information about these areas (including participating in the preparation of detailed feasibility studies). Second, government financial resources designated for industrial development have been made more accessible. Some of the financial instruments employed to date are debentures, loans, and loan guarantees. These mechanisms are designed to leverage a higher level of private-sector investment, and a number of projects have been assisted by these initiatives. A list of major projects recently announced or under construction is provided in Table 7.

With respect to forest products, the global scene is changing dramatically. If the exploitation of tropical forests continues at its present rate, low-cost wood and labor in those regions will allow

Table 7. Major Forestry Projects Proposed or Underway Since 1987

Company and Location	Project	Start-up Date	Status*
Procter & Gamble Cellulose Ltd.			
Grande Prairie	sawmill expansion	Oct 1989	completed
Manning	new sawmill	Jul 1991	proposed
Grande Prairie	pulp mill #1 expansion	Oct 1990	completed
Grande Prairie	new pulp mill	?	proposed
Canfor			
Grande Prairie	sawmill expansion	Apr 1989	completed
Weldwood of Canada Ltd.			
Hinton	pulp mill expansion	Apr 1990	completed
Hinton	new sawmill	Mid 1991	delayed
Daishowa Canada Co. Ltd.			
Peace River	new pulp mill	Jul 1990	completed
Peace River	pulp mill expansion	Spring 1991	proposed
Alberta Newsprint Co. Ltd.			
Whitecourt	new pulp and newsprint mill	Aug 1990	completed
Whitecourt	waste paper recycling plant	?	proposed
Sunpine Forest Products Ltd.			
Sundre	sawmill rebuild	Jun 1989	completed
Rocky Mountain House	new sawmill and fiber board plant	?	proposed
Northern			
Lac La Biche	sawmill rebuild	?	proposed
Alberta Energy Co. Ltd.			
Slave Lake	pulp mill	Nov 1990	completed
Slave Lake	pulp mill expansion	?	proposed
Alberta-Pacific Forest Industries Ltd.			
Athabasca	new pulp mill	?	delayed
Athabasca	paper mill	?	delayed
Miller Western Pulp Ltd.			
Whitecourt	pulp mill	Apr 1989	completed
Grande Cache Forest Products			
Grande Cache	sawmill upgrade	Apr 1989	completed
Sundance Forest Products			
Edson	new sawmill	Aug 1990	completed

*As of November 1990

SOURCE: Forest Industry Development Division (1990)

for significant penetration by new suppliers into markets traditionally dominated by Canada. Suggested development strategies for Canadian producers include product specialization, more efficient production processes, vertical integration into products with higher added value, and the production of more "knowledge intensive" products. Innovation of new technologies is a basic requirement for all these strategies.

OTHER FOREST USERS

In addition to trees, Alberta's forests have a multitude of resources that support economic activities. The wildlife resource supports trapping, sport and commercial fishing, hunting, guiding and outfitting, and related enterprises, such as taxidermy. Although not all trapping takes place on forested lands, several important fur-bearing species, such as wolf, lynx, fisher, marten, wolverine, and squirrel, are primarily forest species. Other species, including beaver, muskrat, coyote, fox, and weasel, are more broadly distributed, but a substantial proportion of this fur harvest comes from forested lands as well. In the 1987-88 trapping season, there were 3,863 registered trappers operating on Crown land, much of which is forested. The value of the fur harvest for the province was over $7 million.

Many big game species, including moose, elk, caribou, deer, bear, cougar, and wolves, depend on forest habitat. As well, several species of grouse and ptarmigan inhabit forests. A multitude of non-game species, such as songbirds, woodpeckers, owls, frogs, insects, and others, add to the diversity of life in the forests. Some of Canada's best fishing is found in Alberta's forest lakes, rivers, and streams.

Many non-renewable resources, including conventional oil, oil sands, natural gas, coal, sand, and gravel, are extracted from our forested lands. Although they don't rely on the treed environment per se, these industries affect forest management. Many oil and gas fields and all of Alberta's oil sands are found in forested areas of the province. The bituminous coal exported to steel mills around the world is mined in the mountains and foothills region.

Economic benefits are also derived from non-consumptive uses of the forest resources. The forests provide an important setting for tourism and many recreational pursuits, such as hiking, camping, and boating. All of Alberta's national parks and most of our provincial parks and recreation areas are set in forested environments. In addition, the Alberta Forest Service operates 212 recreation areas throughout the Green Area at which camping and/or day-use facilities are provided. Also, many recreationists forgo the convenience of established campgrounds. It is estimated that "random" recreation contributes 40 to 50 percent of total recreational use in the Green Area (C. Jones 1989; pers. comm.). Most of this random use appears to be associated with hunting, horseback riding, and off-highway vehicle use. The amenity value of our forested lands is immense.

Forests have values beyond the commercial market place. Resource economists refer to these as extra-market values, such as the existence value, option value, and bequest value (Phillips and Adamowicz 1986). Many Albertans value the fact that our province still has extensive forest lands. There is also the value of having the option to utilize the forests at some later time. The bequest value of providing future generations with a healthy forest environment is important to many people.

CONCLUSION

Although the socioeconomic benefits attributed to use of Alberta's forest resources are considerable, they are not entirely measurable. For some activities, particularly those that are market based (such as the forest industry), economic indicators such as employment and value of shipments do provide measures of the inherent value of the forest to the social fabric of the province. In other cases, however, the benefits are psychological (such as the personal satisfaction gained from a recreational experience) and these are not easily

subjected to cost/benefit analysis. Perhaps it should be sufficient to say that through the clean water provided, the direct and indirect economic wealth generated, and/or through the personal satisfaction associated with being in a forest environment, there are few citizens of the province who do not gain some benefit from our forests. The most important benefits may well be ecological, by providing essential oxygen through photosynthesis, protecting important watersheds, and perhaps an important role in the life-support system of our planet.

The forest industry plays a large role in the economic development and diversification of the provincial economy. Alberta's forest industry is not only growing at an unprecedented rate, the fundamental nature of the industry is evolving. New dimensions worthy of note are (1) a much greater emphasis on the use of aspen, (2) product diversification into a broader range of primary commodities, and (3) diversification of sales from the North American continent into offshore markets (in particular, the Pacific Rim). These developments reflect the forest industry's strategic response to local and international trends and they may well lead to a continuation of Alberta's competitive position in the global forest economy. However, success of Alberta's forest industry will mean increased impacts on the province's forest ecosystems.

Chapter Five

Pulp Production: New Technologies for Alberta

During the past two years, a major expansion in the forest industry has taken place in Alberta, primarily in the production of pulp. There is consequently a great deal of public interest in the technologies for pulp production and pollution control. A brief description of these technologies is given below.

PULPING TECHNOLOGY

There are two principal types of pulping procedures: chemical and mechanical. In chemical pulping, the wood chips are separated into fibers by "cooking" them with chemicals and steam in a pressure vessel. The most common chemical process is called "kraft." Kraft pulping can use a wide range of tree species. It produces strong, dark-colored pulp that is suitable for high-quality papers and a range of other products, including tissue and fluff for disposable diapers. Another chemical process, called "sulphite pulping," produces a weaker but lighter-colored pulp suitable for printing grades of paper. Sulphite pulping is used in older mills in eastern Canada. In mechanical pulping, the logs or chips are ground into fibers with rotating stones or steel plates. This mechanical process is often augmented with heat (thermo-mechanical) or both chemicals and heat (chemi-thermo-mechanical). Mechanical pulps are generally used for newsprint, tissue, bleached board, and fluff. Bleaching is often used to brighten and whiten pulp and can be applied to either chemical or mechanical pulp.

Recent research suggests that other pulping processes may have potential for Alberta's industry. Econotech Services Ltd. (1987) studied the characteristics of several processes using Alberta hardwoods. In the standard kraft process, both trembling aspen and balsam poplar bleached readily to high brightness using a short bleaching sequence. This could be a major advantage over softwoods. The Alberta hardwoods also worked well in the chemi-thermo-mechanical pulp (CTMP) process. The alkaline sulphite/anthraquinone (ASAQ) process is a low-odor process producing a high yield of good-strength pulp. Preliminary research suggests that the ASAQ pulp process may have certain advantages over kraft (Econotech Services Ltd. 1987). A methanol-based process gave slightly inferior pulp characteristics, but may have potential for a low-pollution, smaller scale mill. High-yield sulphite pulping has potential for newsprint. More research on all of these different methods is needed to establish their commercial potential and environmental suitability.

In Alberta, existing and proposed mills will produce bleached kraft pulp (BKP) or bleached chemi-thermo-mechanical pulp (CTMP) (Table 8). Mills in the Peace River drainage will produce about half of the province's bleached kraft pulp output. The rest of the BKP and all of the CTMP will be produced in mills in the Athabasca River drainage.

Table 8. Existing and Proposed* Pulp Mills in Alberta

Company and Location	River Basin	Products	Production Capacity (tonnes/yr)	Wood Supply
Procter & Gamble Cellulose Ltd.				
Grande Prairie Pulp Mill expansion	Wapiti-Smoky-Peace R.	bleached kraft pulp	310,000	100% coniferous
Grande Prairie* New Pulp Mill	Wapiti-Smoky-Peace R.	bleached kraft pulp	300,000	33% coniferous 66% deciduous
Daishowa Canada Co. Ltd.			340,000	30% coniferous
Peace River	Peace R.	bleached kraft pulp		70% deciduous
Weldwood of Canada Ltd. Hinton	Athabasca R.	bleached kraft pulp	385,000	95% coniferous 5% deciduous
Alberta Newsprint Co. Ltd. Whitecourt	Athabasca R.	bleached chemi-thermo-mechanical pulp, paper	220,000	80% coniferous 20% deciduous
Millar Western Pulp Ltd. Whitecourt	Athabasca R.	bleached chemi-thermo-mechanical pulp	210,000	70% coniferous 30% deciduous
Alberta Energy Co. Ltd. Slave Lake	Lesser Slave-Athabasca R.	bleached chemi-thermo-mechanical pulp	110,000	20% coniferous 80% deciduous
Alberta-Pacific Forest Industries Ltd.* Athabasca	Athabasca R.	bleached kraft pulp, paper	496,000	20% coniferous 80% deciduous

SOURCE: Alberta Forest Service (1990)

CHARACTERISTICS OF BKP AND CTMP

The efficient use of natural resources is an important consideration in pulp manufacturing. Bleached kraft mills, in which most of the lignin is removed from the pulp, typically convert 42 to 55 percent of the wood fiber to pulp. In CTMP mills, the lignin is left in the pulp and about 90 to 95 percent of the fiber is converted (Mies et al. 1988). All pulp mills use large quantities of water; however, kraft mills require between 50 and 100 m^3 of water per tonne of pulp, whereas CTMP mills use only 20 to 25 m^3 per tonne (McCubbin 1983). With respect to energy consumption, kraft mills are much more efficient. Lignin recovered in the kraft process is burned to generate power and the mills are basically energy self-sufficient. CTMP mills, which do not recover lignin, rely on external power sources, such as thermal power plants.

Kraft pulp is darkly colored and is bleached to meet the standards for high-quality papers. The conventional bleaching method involves a series of washings with chlorine and chlorine dioxide. The bleaching process is usually the principal source of toxicity and color of the mill effluent (McCubbin 1983). CTM pulp is lighter in color than kraft and requires less bleaching, especially since it is usually used for lower quality papers. Hydrogen peroxide is commonly used to brighten mechanical pulps.

AERIAL EMISSIONS AND LIQUID EFFLUENTS

Pulp mills, like most industrial facilities, produce several air pollutants. Particulates, nitrogen oxides, sulphur dioxide, hydrogen sulphide, and carbon monoxide are among the contaminants produced. Pulp mills also produce water vapor that may contribute to fog formation. Most people are aware that kraft pulp mills also produce a distinctive odor. This odor is primarily a result of a number of reduced sulphur compounds such as mercaptans. Small amounts of chlorine and chlorine dioxide may also be emitted from kraft mills.

Pulp mill liquid effluents have several characteristics. For example, they are generally high in biochemical oxygen demand (BOD). This measure reflects the amount of organic material, primarily in the form of dissolved wood components and suspended wood fibers, being discharged in the effluent. In the recipient waterway, chemical reactions and micro-organisms work to break down this organic material and in doing so consume the oxygen in the surrounding water. Large BOD loadings can seriously deplete the oxygen, damaging aquatic life and water quality.

Effluents from CTMP mills are generally more concentrated than those from BKP mills. This is partly because less water is used, resulting in less dilution of the pollutants. In addition, the CTM process releases more organics from the wood, thus producing effluent with higher BOD. Resin and fatty acids are among the organic components released and they are largely responsible for the effluent toxicity.

Effluents from kraft mills are highly colored. The dark brown color is largely due to the lignins, tannins, and other compounds extracted from the wood during processing. The impact of this color is largely aesthetic. It detracts from water quality for domestic use, livestock watering, and recreation. It also reduces the light available to submerged aquatic plants.

Another special characteristic of effluents from bleached kraft mills is the presence of chlorinated organic compounds. This family of complex compounds includes several highly toxic chemicals such as the highly publicized dioxins and furans.

EFFLUENT TREATMENT

Treatment of mill effluent prior to discharging it into the river is very important in reducing pollution. All mill effluents in Alberta receive both primary and secondary treatment. Primary treatment generally involves settling ponds to remove suspended material, such as wood fibers. Secondary treatment usually consists of biological treatment to remove organics. Kraft mills typically

use aerobic (that is, oxygen is required) treatment in which micro-organisms break down organic waste into simpler waste products. Aerobic treatment can also be used to treat CTMP mill wastes and will be used in Alberta's mills. In some other Canadian CTMP mills, an intermediate anaerobic treatment is required between the primary and secondary treatment described above. Anaerobic (little or no oxygen required) treatment is more suitable for concentrated effluents and employs different kinds of micro-organisms to break down the organic waste.

The quality of pulp mill effluents can also be improved through modifications to the in-plant processing. For example, substituting chlorine dioxide for chlorine in the bleaching process may substantially reduce toxicity and slightly reduce BOD and color of BKP mill effluent (McCubbin 1983). Extended delignification and oxygen bleaching can substantially reduce BOD and color. These three technologies are among the new technologies being incorporated into Alberta's kraft pulp mills.

ENVIRONMENTAL IMPACTS OF MILL DISCHARGES

Many studies have shown changes in biological communities in the waters receiving pulp mill effluents. Wood fibers may blanket the river bottom and nutrients may enrich the water. The water may become toxic through oxygen depletion, elevated salinity, or the presence of toxic chemicals. Most of the acute toxicity can be attributed to resin and fatty acids derived from the wood, and chlorinated phenols derived from the bleaching (D. McLeay and Assoc. Ltd. 1987). Although many studies have focused on effluents from kraft pulp mills, information about the relative toxicity of CTMP mill effluents is scanty. Knowledge of sublethal effects of CTMP mill effluents is "extremely limited or absent altogether" (D. McLeay and Associates Ltd. 1987).

Dioxins and furans, which can be found in trace amounts in effluents from BKP mills, are of great public concern. While it is generally acknowledged that these chemicals are toxic, the actual degree of toxicity to humans is less clear. Different animals react differently to these chemicals. For example, guinea pigs are thousands of times more sensitive to dioxin (2,3,7,8-TCDD) than hamsters are (Harris n.d.). Studies of human exposures suggest that humans appear to be less sensitive than many other animals. However, a skin disorder called chloracne has been shown to result from exposure to high concentrations of dioxin. Other organisms in the receiving water, such as fish and aquatic insects, are at risk.

Clearly, more information about the toxicity of mill effluents is needed. Many of the chlorinated organic compounds in kraft mill effluents have yet to be identified and fully characterized.

GOVERNMENT STANDARDS

Both the federal and provincial governments regulate aerial emissions and liquid effluents from pulp mills. Under the federal Clean Air Act, guidelines have been published for the wood-processing industry. These guidelines apply to kraft and sulphite mills (but not to CTMP mills) and suggest limits on three contaminants: particulates, total reduced sulphur, and sulphur dioxide. Although these guidelines are not directly enforceable, provincial governments normally implement enforceable standards at least as stringent as these guidelines. In Alberta, the regulations under the provincial Clean Air Act set limits on particulates and opacity of visible emissions from most industrial sources, including pulp mills. Detailed guidelines for other contaminants have been developed for certain industries, but as yet there are none for the pulp and paper industry. The provincial government has preliminary guidelines for kraft mills and sets enforceable limits on air contaminants in the permits and licences for individual mills.

Under the federal Fisheries Act, regulations set limitations on certain contaminants in pulp mill liquid effluents. They set standards for total suspended solids, oxygen demand, and toxic substances following primary treatment of the ef-

fluent, which apply to kraft, sulphite, and mechanical mills. These regulations are currently under review and will likely be strengthened by the federal government. Unlike the guidelines for aerial emissions, these guidelines are legally enforceable. No uniform provincial regulations or effluent standards for pulp mills have been formally established in Alberta. The Province regulates pulp mill effluents through the permit and licensing system under the Clean Water Act. Permits stipulate the kind of technology required in the mill and enforceable limits for effluent contaminants are set out for each mill in its licence to operate. Limits on a number of contaminants not regulated by the federal regulations are included in these licences.

During the late 1950s and early 1960s, biochemical oxygen demand (BOD) loadings to the Athabasca River likely consumed all oxygen under winter ice for a considerable distance and eliminated most of the fish and other aquatic fauna.

With regard to public concern about dioxins in effluents from kraft pulp mills, the government's response has been to require state of the art technology in the bleaching stage of new kraft mills. Extended delignification (the removal of lignin from wood fibers), oxygen delignification, and partial substitution of chlorine dioxide for chlorine will substantially reduce the concentration of toxic organochlorides in the mill effluents. However, the effectiveness of these combined technologies has yet to be tested in an operating mill. These technologies will be required in all bleached kraft pulp mills in the province, although the deadlines for compliance have not been established for most of the mills. Effluent quality from Alberta's CTMP mills also poses a challenge. Biosolids discharged from the aerated treatment system can contribute nutrients to the river and the ability of this treatment to detoxify the effluent has been questioned (McAllen 1988).

The Peace and Athabasca rivers will receive effluents from several new pulp mills. The cumulative impacts on these river systems must be thoroughly evaluated. For example, low winter flows in the Athabasca River limit the ability of the river to assimilate oxygen demand created by the effluents. Such cumulative impacts were considered by the Alberta-Pacific Environmental Impact Assessment Review Board, mentioned in Chapter Two. Their report outlines several disturbing findings (Alberta-Pacific EIA Review Board 1990). From the limited data available, it appears that past pulp mill discharges to the Peace and Athabasca Rivers have already contaminated these river systems. Concentrations of dioxins and furans in fish near existing kraft pulp mills exceed the guidelines for human consumption of fish established by Health and Welfare Canada. Furans were even detected in fish in the Slave River, many hundreds of kilometres downstream. During the late 1950s and early 1960s, biochemical oxygen demand (BOD) loadings to the Athabasca River likely consumed all oxygen under winter ice for a considerable distance and eliminated most of the fish and other aquatic fauna. Although modern technologies have reduced BOD loadings from these pulp mills, the Review Board expressed concern that current loadings may still be affecting the fish and that any increase may jeopardize the Athabasca River fisheries.

Chapter Six

Interactions Among Forest Users

FOREST LAND USE WORKSHOP

On June 19, 1987, the Renewable Resources Sub-Committee of the Public Advisory Committee to the Environment Council held a workshop on forest land use (Renewable Resources Sub-Committee 1987). Several different user groups were represented at this meeting, including the forest industry, non-renewable resource industries (petroleum and natural gas, mining, utilities), ranching, trapping, several forms of recreation, and natural habitat. The meeting focused on how these different activities interact in the forested regions of Alberta. Participants felt that most conflicts could be resolved if forest users are open-minded and willing to negotiate. The following discussion is derived largely from this workshop.

MANAGING OUR FORESTS

Many activities are compatible and well suited for multiple use. Non-mechanized recreation, for example, has little effect on wildlife. Timber harvesting can enhance deer habitat. However, some activities interfere with other uses and compete for the same parcel of forest. The development of energy resources disrupts timber harvesting sequences. Logging interferes with trapping. Pulp mill effluents can affect fish habitat. This array of activities presents a real challenge to our forest managers.

Government's Role

Integrated Resource Planning provides a mechanism for addressing the complexities of multiple use. Integrated Resource Plans go through several drafts and sometimes take years to complete. At a technical level, this planning process is comprehensive and relatively advanced. A number of suggestions for improvement, however, have been made and merit serious consideration. Direct representation of interest groups on the planning teams would be better than relying on government agencies to represent these interests. For example, forestry companies operating in the area are not on these planning teams, but are represented by the Alberta Forest Service. The interests of trappers and hunters are represented by the Fish and Wildlife Division and the Department of Energy or the Energy Resources Conservation Board represent the energy resources companies. More satisfactory compromises could be reached if the people or companies directly involved in resource development were on the planning team.

The information available for decision making needs to be improved through more comprehensive resource inventories and research. Although comprehensive inventories exist for timber and petroleum resources, detailed information about wildlife is lacking. Other suggestions include improving the flow of information to the general public; providing more opportunity for public input through advisory boards and public hearings; encouraging more direct consultation between users; providing more emphasis on environmental, social, and fiscal impact assessment; formalizing the planning system through legislation; incorporating planning models to support the decision-making process, and making a greater effort to forecast and accommodate future resource priorities (Renewable Resources Sub-Committee 1987).

Some government policies seem to contribute to conflicts between certain forest users.

For example, provincial government policy directs forestry companies to harvest "overmature" timber first. This forest type provides habitat for a number of wildlife species and is particularly important to trapping operations. Forestry companies are blamed for ruining local trapping, but they feel that provincial guidelines limit their ability to accommodate trappers' needs. Some forest users contended that management and stewardship of our forests needs to be more accountable and effective.

Forest Industry's Role

A company with a Forest Management Agreement manages the entire area, including the harvested cutblocks, the unharvested stands, and stands that will never be harvested. The company develops long-term harvest plans as well as annual operating plans, both of which must be approved by the Alberta Forest Service. Values other than timber production are considered, although the latter is the primary management goal of the company. While FMA holders can accept land-use designations within their management area that exclude logging, such as prime protection zones, they are frustrated by the changing rules and new conditions that are constantly being introduced. Forestry companies manage their FMAs for long-term returns on their investment. Long-term planning, which is vital to timber management, is often disrupted by changing rules or as parcels of forest are removed from timber production for other uses. Other forest users face similar frustrations, for example, when protected forest lands are opened up to timber harvesting.

[At the forest land use workshop] it was also recognized that certain stereotypes, such as the fiber-hungry logger and the tree-hugging preservationist, contribute to misunderstanding and inhibit conflict resolution.

In developing forest management plans, forestry companies consult other user groups, such as local trappers, recreation groups, and ranchers. Contacting all of the interested parties can be difficult. For example, the forestry companies have difficulty contacting all of the trappers in their area, especially the part-time trappers. Consulting the general public (which also has a stake in forest management) presents another challenge, especially the large population of forest users who live in urban centers.

Consultation must involve more than simply informing the other users of the company's harvesting plans. The needs of the other users must be taken into account during the development of these plans. A high value should be placed on direct consultation and discussion. The forest land use workshop identified improved communication among forest users as an important method of resolving conflict (Renewable Resources Sub-Committee 1987). Many conflicts are simply misunderstandings. It was readily apparent that certain words and technical terms had different meanings to different people in the workshop. It was also recognized that certain stereotypes, such as the fiber-hungry logger and the tree-hugging preservationist, contribute to misunderstanding and inhibit conflict resolution.

Examples of integrating different forest uses are beginning to emerge. Committees of government and industry foresters and wildlife biologists have been formed to develop management recommendations for the Weldwood forest management area near Hinton and the Daishowa forest management area near Peace River. Timber management plans will be designed to accommodate fish and wildlife needs, for both game and non-game species. Other forestry companies should initiate similar committees. These committees could be expanded to include other user groups to better reflect integrated resource management. It must be recognized, however, that some positions are not negotiable and conflicts cannot always be resolved by direct discussion with different forest users. Some activities, such as mechanized and non-mechanized recreation, or mining and habitat preservation, are not compatible. Land use zones should help to separate incompatible activities. The government often plays an important role as the final arbiter in resolving disputes.

Multiple use is the goal and we should encourage the greatest variety of uses of our forest resources. However, there is a place for single-use or dual-use designations.

FOREST MANAGEMENT ISSUES

Timber Harvesting

In Alberta, clearcutting is the standard method for harvesting timber. It is an efficient method of harvesting and is well suited to natural reforestation. However, because it promotes aspen proliferation, it can make reforestation with conifers difficult on some sites. Some forest users would prefer to see more consideration given to other methods, such as selective cutting. Clearcutting has substantial effects on wildlife habitat. Although the trees eventually grow back, there is a long period during which a mature forest habitat is not available for wildlife. Standing dead trees, which are important for cavity-dwelling birds and animals, are often removed from cutblocks along with the merchantable timber, or are knocked down during scarification. Increased runoff from cutblocks can affect streamflow and fish habitat. Selective harvesting may have less impact on aesthetics, recreation, certain wildlife species, and the hydrology of the area.

The practice of harvesting timber from an area in two passes could be modified to benefit other forest values. In a coniferous forest, the leave blocks can be harvested after the new trees in the original cutblocks have reached a height of at least two metres. This second cut can produce a mosaic of two-metre trees and patches without trees. Such a landscape has limited value for other forest users especially those requiring mature forest. At some sites the second pass could be delayed until the trees in the first cutblock are taller or the area could be harvested over a longer term using three passes instead of two. This would maintain more mature stands in the area.

There is some public pressure to change harvesting practices in Alberta. Clearcutting is poorly regarded by some people and past practices in Alberta and especially in other provinces have been shown to be aesthetically unpleasing and conducive to erosion. Some forest users contend that the cutblocks left by current harvesting practices are too large. Trappers find that large cutblocks are detrimental to fur-bearing animals. Furthermore, large cutblocks are more difficult to manage for aesthetics. On the other hand, some ungulate species benefit from large cutblocks. From a wildlife perspective, the size of the cutblock is not as important as its shape. Long, narrow cutblocks that encompass a large area may provide suitable browse and adequate access to thermal and escape cover for some wildlife species, especially large ungulates. Landscape architects can assist in planning cutblocks for improved aesthetics. More input from wildlife biologists would be beneficial.

There are a number of reasons why foresters have resisted the use of selective harvesting in Alberta:

- The method is difficult to employ without "high grading" the forest stands, leaving inferior genotypes to produce the regeneration.
- Residual trees are generally not stable if they grew to maturity in a crowded stand. When surrounding tree are selectively removed, the residuals tend to blow over within the first few years after cutting. This is especially true for white spruce and lodgepole pine, Alberta's main commercial coniferous species.
- Most of Alberta's forest originated after fires, which has produced stands of relatively even age. The trees in these stands all reach a harvestable size at about the same time, favoring a single harvest.
- Damage to the residual trees is practically unavoidable, resulting in the loss of valuable timber.
- Harvesting costs are higher.
- Lodgepole pine, trembling aspen, and, in some parts of the province, white spruce require intense light and warm soil for successful regeneration. They are early successional species and are intolerant of

shading. Selective harvesting does not produce suitable conditions for successful regeneration.

- Environmental impact is increased because of repeated entry into the forest to take out the mature trees.

Any pattern of timber harvesting modifies wildlife habitat. Some species benefit, but others do not. Biologists have identified a substantial decline in the numbers of woodland caribou in the Grande Cache area. Although wolf predation is implicated as a major factor, timber harvesting has reduced caribou habitat, creating more pressure on the population. As a result of discussions with the local FMA holder, timber management plans for this area will be modified to accommodate the caribou herd; however, the success of these measures is uncertain. Earlier and more thorough research into wildlife needs might have anticipated and prevented this population decline.

In view of the expansion of timber harvesting into new areas and the new interest in aspen, much more information about effects on wildlife is needed. Although more staff have been hired to enforce wildlife regulations, the provincial government appears to have placed a very low priority on wildlife research. In addition, cutbacks to the Canadian Wildlife Service have hindered federal programs. There is real potential for future conflicts between an expanding forest industry and wildlife management.

Herbicides

Herbicide use in timber management is an issue of considerable public controversy. Herbicides appear to provide a cost-effective solution to the serious problem of competition from grasses and poplar trees in coniferous plantations. However, some members of the public are concerned about the safety of such chemicals and the desirability of their use in public forests. The effects of herbicides on wildlife, aquatic life, recreation potential, and aesthetics are important considerations. Herbicides disrupt natural successional patterns in favor of the desired tree species. Vegetation removed by herbicides can be important for small game and other animals, although there are indications that herbicides may promote diversity of browse species in some areas. While commercial forestry companies maintain that judicious application of herbicides is critical to maintaining a productive commercial forest, they also support some research into non-chemical means of stand tending, such as mechanical thinning and biological controls.

Access

The development of natural resources in Alberta's forested regions often involves constructing temporary or permanent access routes. These include logging roads, seismic lines, pipeline and utility corridors, and so on. Sometimes the access route for one resource development can be used by other forest users. Often, however, lack of co-ordination or unique access needs lead to construction of separate access routes for the various activities.

Access routes into the forest generally benefit people. Some recreationists, in particular, benefit from access created by resource development. There is sometimes public pressure to keep industry roads open, even when the company has no further use for the road and is prepared to reclaim it. Uncontrolled access, however, can lead to problems. Other users of the corridor may not adhere to safety and environmental restrictions. Overuse can damage habitat and cause erosion, especially around watercourses. Sometimes resource corridors create access to sensitive wildlife habitat. Big game populations can be jeopardized by increased hunting pressure that results when new access is created. More patrolling and stricter enforcement of hunting seasons and bag limits is necessary, adding to the heavy workload of the provincial Fish and Wildlife staff.

The expansion of the forest industry will result in a proliferation of roads in northern Alberta. Human activity in the forest will generally increase as more people work and recreate there. Careful planning and more public education will be needed to avoid an increase in access-related conflicts. Better planning and co-ordination among resource industries, designated routes for different activities, and prompt and effective

closure and reclamation of temporary routes would benefit all forest users. Resource industries are usually well regulated with respect to transportation corridors. More involvement of recreation organizations in trail maintenance, for example, would be beneficial.

Natives and Forestry Development

Forest industry development has both positive and negative effects on the native community. On the positive side, forest management, harvesting, and processing of forest products provide employment opportunities. On the negative side, natives have traditional ties with the natural forest and have concerns about the effects of timber harvesting on wildlife and the forest environment. Some of the areas being committed to FMAs are also subject to unsettled native land claims. The Alberta-Pacific Environmental Impact Assessment Review Board (1990) recommended native involvement in the preparation of forest management agreements. There should be a greater consideration of native interests and more involvement of the native community in the management of our forests as the forest industry expands into northern Alberta.

Chapter Seven

Toward The Sustainable Use of Alberta's Forests

INTRODUCTION

Forests have been part of Alberta's landscape for thousands of years, long before human influence became significant. The forest is a dynamic ecosystem, undergoing gradual successions while experiencing fires, droughts, population cycles, and other short-term changes. Although it is constantly changing, the forest is a renewable resource. Many of the forest components, such as wildlife, timber, forage, and water, are also renewable; with proper management, they will continue to exist and produce. However, renewal is not guaranteed. Examples of species extinctions, unsuccessful reforestation, overgrazing, and water shortages exist in managed forests around the world. To date, Alberta has had a relatively successful history of forest management.

The notion of sustained development of the forest resources is entrenched in various government policies. For example, the sustained yield policy for the timber resource has been in full effect since 1966 (Alberta Forest Service 1983). This policy dictates that the annual rate of timber harvest must be at least matched by the annual rate of growth. With respect to other forest resources, Alberta's Fish and Wildlife Policy commits the government to pass wildlife resources to succeeding generations as they were received (Alberta Fish and Wildlife 1982). In its draft policy statement, Alberta Recreation and Parks acknowledges its responsibility to conserve an adequate resource base to ensure future outdoor recreation needs (Alberta Recreation and Parks 1985). These policies are a beginning, but much work remains to be done.

The difficulty of sustainably developing forest resources presents a major challenge to the forest manager. In their book *Forest Management*, Meyer et al. (1961:3) put this topic into perspective:

> *Probably in few other fields of resource management are the problems as complex, the goals as difficult to achieve, the effects as far reaching, and the results as stimulating as in the management of a forest. The multiplicity of uses, the long-term planning, the high intrinsic values, and the often unique economic benefits demand the utmost skill in the application of technical knowledge and business principles.*

Chapter Seven examines some of these challenges as they relate to the Alberta situation.

UNFORESEEN CHANGES IN PRIORITIES

Social values and land use priorities will continue to change. Objectives for development of Alberta's forest resources need to be updated regularly to reflect these changes. The easiest tracts of land to make changes on are in areas where previous allocations are unaffected. There are, however, few areas in Alberta where a reassessment of objectives would not affect existing land uses and place new restrictions on certain activities. Investments in intensive forestry are particularly sensitive to the perceived stability of priorities for

resource development. Priorities may have to change as we strive to make development sustainable, but such changes may be strongly resisted by special interest groups that favor existing priorities.

GREATER CONTROL OVER FORESTRY EXPANSION

During the past couple of years, the Alberta government has actively promoted forestry development in northern Alberta. As discussed in Chapter Four, Alberta's two existing pulp mills have undergone major expansions, other pulp mills are now operating and others have been proposed. New and expanded sawmill operations have also been proposed. The suddeness and magnitude of this expansion of Alberta's forest industry are significant. The land base needed to supply timber to these mills is very large (Figure 4) and Integrated Resource Plans have yet to be completed for most of these areas.

Alberta was fortunate to have one of the few large supplies of unallocated timber in North America, and this has attracted many forestry proposals. Negotiations for the proposed FMAs were held without public disclosure until the successful company was selected and the specific project approved in principle. Although public involvement following this selection process is improving, many of the important decisions have already been made.

Negotiations for the proposed FMAs were held without public disclosure until the successful company was selected and the specific project approved in principle. Should we have committed our remaining timber supply so quickly?

Should we have committed our remaining timber supply so quickly? The value of our unallocated timber may even be greater in the future. Cycles in the forest industry indicate that this is not the last opportunity for expansion. Perhaps we should reserve some of our timber supply for the future. New and better technologies are quickly developing and may surpass the kraft and chemi-thermo-mechanical processes to which we are committed. Alberta's experience with mixedwood timber management is very limited and there could be great benefit to proceeding now with some of these new forestry developments and later expanding the industry as we learn more about mixedwood management and aspen-based technologies.

FOREST RENEWAL

A fundamental requirement for long-term sustainable fiber production is the prompt restocking of harvested sites. Many years ago, Alberta's foresters believed that reforestation following harvesting could be accomplished through natural processes; however, after the first decade of harvesting, the need for active intervention became apparent (Crossley 1977).

The success rate for regeneration of harvested sites based on current standards is 96 percent (Drew 1988). The notion, however, that coniferous crops will continue to grow satisfactorily following establishment is being challenged. Follow-up surveys of replanted coniferous stands have indicated that many sites originally considered to be satisfactorily stocked are succumbing to competition from other vegetation (Drew 1988). Forest managers have expressed a critical need for adopting new and more intensive regeneration systems. The recently revised government reforestation regulations address some of these problems. The time period for final evaluation of restocked cutblocks has been extended and a requirement that conifers be free from competition from other vegetation has been added. Standards for pure hardwood (deciduous) and mixedwood stands have also been established.

These new reforestation standards may have benefitted from consultation with other forest users. Our next generation of forests will likely

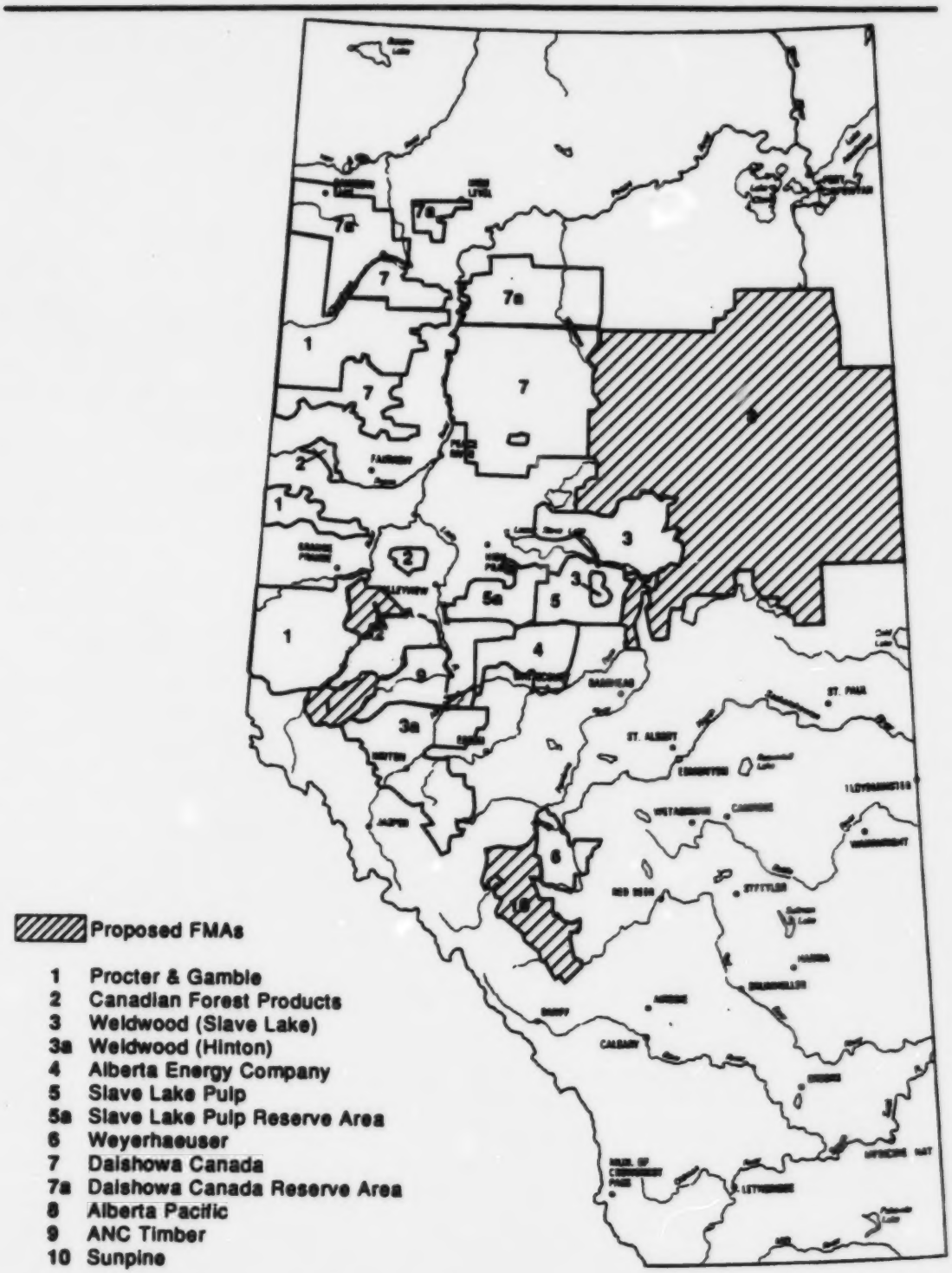


Figure 4. Existing and Proposed Forest Management Agreements
Source: After Alberta Forest Service (October 1990)

experience increased use by other industries, recreationists, tourists, and others. If reforestation standards were more sensitive to the needs of these other forest users, a broader range of benefits could result from forestry development.

Where conifers are the desired species, herbicides offer a possible means of reducing competition from grasses and hardwoods. In an effort to fulfill their responsibility to ensure sustained production, forestry companies have been seeking government permission to use herbicides in Alberta forests. Generally, they would be applied once to allow conifer seedlings to reach the free-to-grow stage with reduced competition from other vegetation. If competition from hardwoods continues to be strong, permission for subsequent applications of herbicide would likely be sought.

A greater understanding of the complex relationships between site parameters, treatment requirements, and the dynamics of stand development will be needed to develop site-specific prescriptions that meet biological, environmental, and economic performance criteria. The research community has started addressing these areas with the development of a site classification system, research into the effectiveness and environmental impacts of various chemical and non-chemical vegetation treatments, ongoing trials of various site preparation methods, and through biotechnology research. A continued commitment to biologically effective, environmentally safe, and economically justified prescriptions will be necessary. A more thorough understanding of the non-timber forest resources will aid the evolution from timber management to forest ecosystem management.

Some people feel that current silvicultural practices will create a forest that is an even-aged monoculture of certain tree species. Such a monoculture may enhance timber production, but has limited value for other forest users. The forest companies claim they are not creating a homogeneous forest. A managed forest with harvested cutblocks, replanted cutblocks, and unharvested stands can still support a level of biological diversity. They plant two of the conifer species (lodgepole pine and white spruce) and several genetic strains. A true monoculture would be very difficult and expensive to achieve and is not the aim of forest management. Much reforestation is achieved through natural regeneration and even planted stands contain trees of natural origin as a result of seeding-in from adjacent stands. Indeed, the origin of Alberta's natural forests with forest fires in the Eastern Slopes has produced large, even-aged stands of pine. Most of these pine stands, however, are successional stages that would mature into mixed-age, mixed-species old growth forests in 150 years or more of undisturbed growth.

OLD GROWTH FORESTS

The management of old growth forests is an important issue. The current policy with respect to timber harvest in designated FMAs is to remove the oldest stands first. This makes sense from a timber production point of view, because the volume of merchantable timber in overmature stands is either constant or declining, particularly for stands containing poplar. Old growth forests may also harbor a wide variety of insects and disease organisms that can attack younger, less diverse forest stands. Furthermore, the large amount of fuel in old growth stands may increase their susceptibility to fires. However, the high moisture level in the old growth forest greatly lowers this fire hazard (Robinson 1988). To some degree logging artificially replaces fire as an agent in converting old growth stands to earlier successional stages. However, nutrients that are released into the ecosystem by fire are largely removed by clearcut logging.

Other important considerations extend beyond the problems of timber production for

industrial uses. A draft position paper on forestry by the Federation of Alberta Naturalists states that:

> *If forest allocations are being made...without due regard for the need to preserve old-growth, mixed-aged forest stands, then we have already entered the era of over-harvest. We need an intelligent, responsible plan for the maintenance of extensive tracts of old-growth, mixed-age forest. We need such a plan before we negotiate FMAs. (Federation of Alberta Naturalists 1989:3).*

Numerous studies have shown that climax communities such as our old growth forests, provided they are not severely disturbed, are highly stable yet dynamic ecosystems. They are energy efficient, with a large biomass supported per unit of energy flow, but the production of new biomass is slow. They have greater species diversity, particularly at the microbial level, than communities at earlier stages in successional development. The dynamic stability and complexity of the climax forests of this province provide critical habitat for a number of rare and highly specialized plants and animals such as Alberta's threatened caribou. The amenity value of old growth forests is very high and they contribute much to the multiple use value of our forests. Indeed, many feel that the liquidation of old growth stands in this province will result in a large reduction in non-timber resource values. The significance of such a loss is perhaps best stated by Walter and Breckle (1985:184):

> *The great heterogeneity of virgin forest, which is further increased by areas of fire and storm damage, as well as the large mass of standing and fallen dead wood, gives rise to so many different biotopes and small niches, that a large number of higher plants and also fungi are able to develop; this in turn, makes possible a rich fauna of vertebrates, arthropods and others. Compared with this a homogeneous managed forest is monotonous and barren.*

Another reason to retain adequate tracts of old growth forest is the scarcity of specific information about northern climax forests. Most forest research has been and continues to be focussed on problems related to timber production, while studies of individual species, species composition, and the dynamics and stabilizing processes of old growth forests are relatively rare. Such vital information seems essential to the management of our northern forests.

CLIMATIC CHANGE

Many people are convinced that we are on the verge of a radical climatic change, a consequence of which is commonly referred to as the "greenhouse effect." The burning of fossil fuels, destruction of the tropical rain forest, and other human activities are contributing to the buildup in the atmosphere of carbon dioxide and other gases that trap heat radiating from the Earth's surface. Computer models of this phenomenon indicate that the atmospheric concentration of carbon dioxide may double and the average annual temperature may increase by 1.5 to 4.5 Celsius degrees within about 50 years (Rizzo 1988). This warming trend is expected to be greater at higher latitudes than in equatorial regions. This temperature change is large, and the rate of change is unprecedented.

Some of Alberta's current forest management practices help to temporarily reduce the buildup of atmospheric carbon dioxide. Young, rapidly growing trees take up more carbon dioxide for photosynthesis than older, mature trees. Reforestation following timber harvesting therefore increases the forest's utilization of carbon dioxide. In addition, our fire prevention system

reduces the release of carbon dioxide from forest fires. The greenhouse gases released by timber harvesting and wood processing technology, however, may well cancel out the beneficial effects of reforestation and fire suppression practices in Alberta.

The greenhouse effect is expected to cause a shift of vegetation zones around the world. Conditions favorable to the boreal forest in Canada may exist 300 to 450 km further north than at present. However, several other factors, such as precipitation patterns, soil conditions, and seed dispersal rates will limit the northward expansion of the forest. A northward shift of grassland and aspen parkland is anticipated and would displace some of the southern areas of existing boreal forest (Zoltai 1988). This would reduce the overall size of the boreal forest in Alberta.

The precise magnitude of the climatic changes in Alberta and the response of our forest ecosystems are difficult to predict. Warmer temperatures and greater availability of carbon dioxide may increase growth rates of forest trees in some areas, depending on precipitation and soil conditions. Changes in growth rates and distribution of commercial tree species could affect annual allowable cuts and timber allocations. The frequency and intensity of forest fires may increase and distributions of forest insects and disease organisms may shift (Singh 1988).

Although the climate will likely change gradually over the next few decades, today's decisions will determine the ability of the Alberta forest industry to adapt to the new conditions. The trees being planted today will experience this climatic change. Seeding or planting tree species and genetic strains that are better adapted to the new conditions may mitigate the harmful effects of climate change. Companies entering into new Forest Management Agreements will need to consider these changes in their long-term planning. More Alberta-based research will be needed to monitor actual changes in Alberta's forest ecosystems.

EXTENSIVE VERSUS INTENSIVE MANAGEMENT

In Alberta, forestry has generally followed a philosophy of extensive forest management. Timber is harvested from a large land base and, as cutblocks are reforested, the trees are allowed to grow under natural conditions with minimal inputs of stand tending and chemical applications. Intensive, plantation-style forestry can grow more timber on a smaller land base, but with more external inputs. Intensive forest management resembles agricultural crop production in many ways.

Some intensive forest management tools are used in Alberta, such as artificial seeding and planting, genetic improvement of the seedlings, forest fire fighting, and sanitation cutting to remove infested or diseased timber that may threaten commercial stands of timber. Other intensive management tools include pruning, stand thinning, drainage, irrigation, and application of fertilizers and pesticides. Some of these latter tools are receiving limited use, primarily for research purposes. Herbicides are being tested to control competition from grasses and aspen. Experiments in northern Alberta are examining the effects of drainage on timber production in forested wetlands (Hillman 1987).

Extensive forest management is more compatible with the government's current strategy of multiple use on Crown lands. Wildlife, timber, recreation, minerals, and other resources exist on any given parcel of land, and the current approach is to encourage multiple use where feasible. Intensive forestry would tend to limit the use of other resources in commercial forests, but because a smaller land base is needed for timber

production, other forested lands would be available for other uses.

Economics and government regulations are major factors determining the intensity of timber management practised in Alberta. Many of the tools of intensive forestry are currently expensive. They involve more labor, equipment, and supplies. The value of increased timber production must exceed these costs in order for intensive management to be seriously considered. As forestry expands in Alberta and technologies improve, intensive management practices may benefit from the new economies of scale. Greater pressure may be exerted in favor of intensive forest management.

BARRIERS TO SUSTAINABLE DEVELOPMENT

Several examples of factors inhibiting sustainable resource use have been discussed in this paper. These examples relate to two general problem areas: the uncertainty of biological response to forest management, and the inherent complexity of determining resource management priorities.

There is great need to add to the knowledge base and understanding of forest dynamics in order to increase the ability of forest managers to manage the resource with predictable outcomes. The forest renewal problem of competing vegetation in restocked areas is just one of a number of variables contributing to uncertainty in timber supply analysis. Other variables include accuracy of the timber inventory, security of the land base available for timber harvesting, inadequate knowledge of the growth and yield of managed stands, unforeseen losses to wildfire and disease, and possible impact of climatic change and other catastrophic events on the forest ecosystem. Information is also needed about other forest resources. Although there has been extensive exploration for minerals and petroleum resources in some forested areas, further exploration will be required. Data on wildlife distribution and abundance is very limited and this will hamper improvements in forest management. The ultimate question that must be addressed is, to what extent can Alberta forests be altered while still providing a perpetual supply of benefits and a high-quality forest environment?

As demands for fiber products increase, there may well be increased pressures for short-term policies that could undermine the sustainability of our forests. It is therefore important to refine Alberta's approach to determining the socially optimal mix of benefits from our forest resource. If use is to be sustainable, there is a fundamental need to be in a position to clearly state what the socially desirable mix of uses is to be. One mechanism that contributes to this task is the Alberta government's Integrated Resource Planning System (IRPS).

In a working paper discussing Alberta's Integrated Resource Planning System, Petch (1985) describes four of the six IRPS principles as sound general planning principles common to most advanced types of public land resource planning. These principles include

1) flexibility
2) rationality
3) comprehensiveness
4) meaningful public involvement.

In addition, two other planning principles have been adopted to fulfill the system's role as a planning aid to integrated resource management: a team approach, and land and resource integration.

Petch (1985) suggests that, in general, clients (in this case identified as various provincial government agencies involved in land management) were satisfied with the IRPS. However, as mentioned in Chapter Six, some other clients, namely some public and non-government organizations, are concerned that their needs may

not be met. There are some areas in which the system could be extended, refined, and improved. They include

- greater emphasis on environmental, social, and fiscal impact assessments
- more consideration of alternatives when evaluating methods of achieving goals
- enhancement of the data and information base for evaluation of options
- establishment of a long-term political commitment by formalizing the IRPS through legislation.

Although Integrated Resource Planning has been underway in Alberta for over a decade, only some higher priority sub-regional and local plans have been completed. No provincial plan has been finished and, apart from the Eastern Slopes Policy, broad regional plans have not been completed. These plans are needed to give general direction to resource managers.

The limited financial and staff resources provided for Integrated Resource Planning bring the government's commitment to this process into question. Major decisions affecting resource allocations continue to be made for areas for which Integrated Resource Plans have yet to be completed. Although such decisions cannot be delayed indefinitely while planning is completed, the value of the planning system is diminished once commitments have been made.

Some improvements are on the horizon. An effort is underway to refine provisions of the Forest Management Agreements through integrated resource planning for the recently announced FMAs. The merging of company forest management plans with Integrated Resource Plans may improve forest management in these areas.

Chapter Eight

Conclusion

In the future, competition for Alberta's forest land base will likely increase. More intensive silvicultural practices may be applied in certain areas to enhance wood fiber production. Single-use designations may become more common, although multiple use will remain the preferred policy. If current timber management practices are maintained, natural habitat for certain wildlife species will continue to decline while that for others will increase. In many cases, habitat loss will affect species that we already have difficulty maintaining, for example, those sensitive to disturbance, and those requiring large expanses of old growth forests. Demand for outdoor recreation opportunities, especially those forms of recreation that require an undisturbed natural setting, will likely increase. Alberta's forests should be managed as ecosystems, reflecting the variety of resources and complexity of their inter-relationships. The principle of integrated resource management should be encouraged and refined.

At the 80th Annual General Meeting of the Canadian Institute of Forestry held at Prince Albert, Saskatchewan in 1988, a resolution was passed supporting the development of strategic plans for the forest sector that provide specific goals and realistic as well as achievable targets for the management of the forest land base. It is essential that these strategic plans recognize the importance of forests for benefits other than wood fiber production, such as biological diversity, ecological support systems, and amenity values.

The preparation of the National Forest Sector Strategy in 1987 was a step in this direction. However, the need for an explicit forest sector conservation strategy may be particularly acute in Alberta. The forest industry is growing at an unprecedented rate with the active encouragement of the provincial government. Long-term development targets, the criteria for government involvement, and the basis for awarding large timber dispositions have not been clearly defined nor publicly discussed. A strategic plan would encourage investment in the forest industry by reducing the number of uncertainties. It is therefore important that the strategy support the sustainability of all forest resources while allowing for efficient, rapid response to changing economic, social, and environmental conditions.

Instilling a consciousness about the desirability of sustainable development of Alberta's forests should continue to be a priority. Many mechanisms for sustainable forest development are in place and they are among the most advanced in Canada. However, in response to both existing and changing social priorities, technology, forest renewal problems, and environmental and economic circumstances, there is a continuing need to modify and enhance existing policies, procedures, guidelines, planning systems, and regulations. Resources are limited and the issues are often complex. The conservation strategy process can play a fundamental role in identifying and prioritizing these areas for the benefit of all forest users.

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Appendix One

Other ACS Publications Relevant to Forest Management

Alberta's Wetlands: Water in the Bank!
A Place for Wildlife
Oil and Gas in Alberta: An Uncertain Future
Foundations for the Future: Alberta's Mineral Resources
Dinosaurs and Distant Drums: The Future of Alberta's Heritage Resources
Agricultural Considerations for Today and Tomorrow
Tourism in Alberta
Reserves for Nature
Wilderness (In press)
Parks and Recreation (In press)

Appendix Two

Members of the Renewable Resources Sub-Committee

The following people served on the Renewable Resources Sub-Committee at some time during the preparation of this discussion paper.

Mr. Don Appleby* — Cold Lake Community Advisory Committee
Mr. Nelson Barber — Alberta Trappers' Association
Mr. Jerry Bauer* — Alberta Forest Products Association
Dr. Bill Cox — Alberta Veterinary Medical Association
Mr. Hugh Craig — Western Barley Growers' Association
Mr. D. Cutheill* — Federation of Alberta Naturalists
Dr. Bruce P. Dancik — Trout Unlimited Canada (Alberta Council)
Dr. Ted Drouin — Keyano College
Dr. David K. Elton — Canada West Foundation
Mr. Clark Fawcett — United Farmers of Alberta Co-operative Limited
Mrs. Elsie Friesen — Unifarm
Mr. Harvey Gardner — Federation of Alberta Naturalists
Mr. Tim Garner — Fairview College
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Mr. Glen Kingdon* — Alberta Snowmobile Association
Mr. Ed Kulcsar — Canadian Institute of Forestry
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Ms. Adrienne Lacombe — Cold Lake Community Advisory Committee
Mr. Garry Leithead — Alberta Forest Products Association
Mr. Stacy Linington — Northwestern Fishing Co-op
Mr. Brian MacDonald — Grande Prairie Chamber of Commerce
Mr. Don Mallon — Edmonton Chamber of Commerce
Ms. Janis McLean-Hayden — Alberta Wilderness Association
Mr. Brian Meller — Lethbridge Community College
Mr. David Porter — Canadian Petroleum Association
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Mr. Ron Whistance-Smith — Unaffiliated
Mr. Tim Williamson — Canadian Institute of Forestry
Mr. Stan Wiskel — Western Barley Growers' Association
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About Our Logo

Alberta

ENVIRONMENT COUNCIL OF ALBERTA

Over the past two decades, the logo of the Environment Council of Alberta has shown three overlapping triangles as representing the foundations of our environment: land, air, and water. These triangles also represent the three groups with which the ECA interacts: industry, government, and the public. The three triangles intersect to form a circle symbolizing the biosphere. The small triangle in the centre of the circle symbolizes these three groups joining together to work for the conservation of our environment.

In 1980, the overlapped triangle motif was used by the World Conservation Strategy to represent the three primary objectives of that document. The Alberta Conservation Strategy incorporated the triangle motif into its logo by overlaying the WCS triangles onto a three dimensional outline of Alberta. This combination of triangles with the readily identifiable outline of provinces, nations, and regions has marked conservation strategies around the world.